DANA.

Instruction Manual

980203

MODEL 5500/112-130 DIGITAL VOLTMETER

INSTRUCTION MANUAL

980203

DANA MODEL 5500/112-130
DIGITAL VOLTMETER

INTERTYME METROLOGY
Laboratory, Inc.
650 Vaqueros Ave.
Sunnyvale, Calif. 94086

DANA™

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Irvine, California 92664

Telephone (714) 833-1234
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January 1968
Revised February 1972

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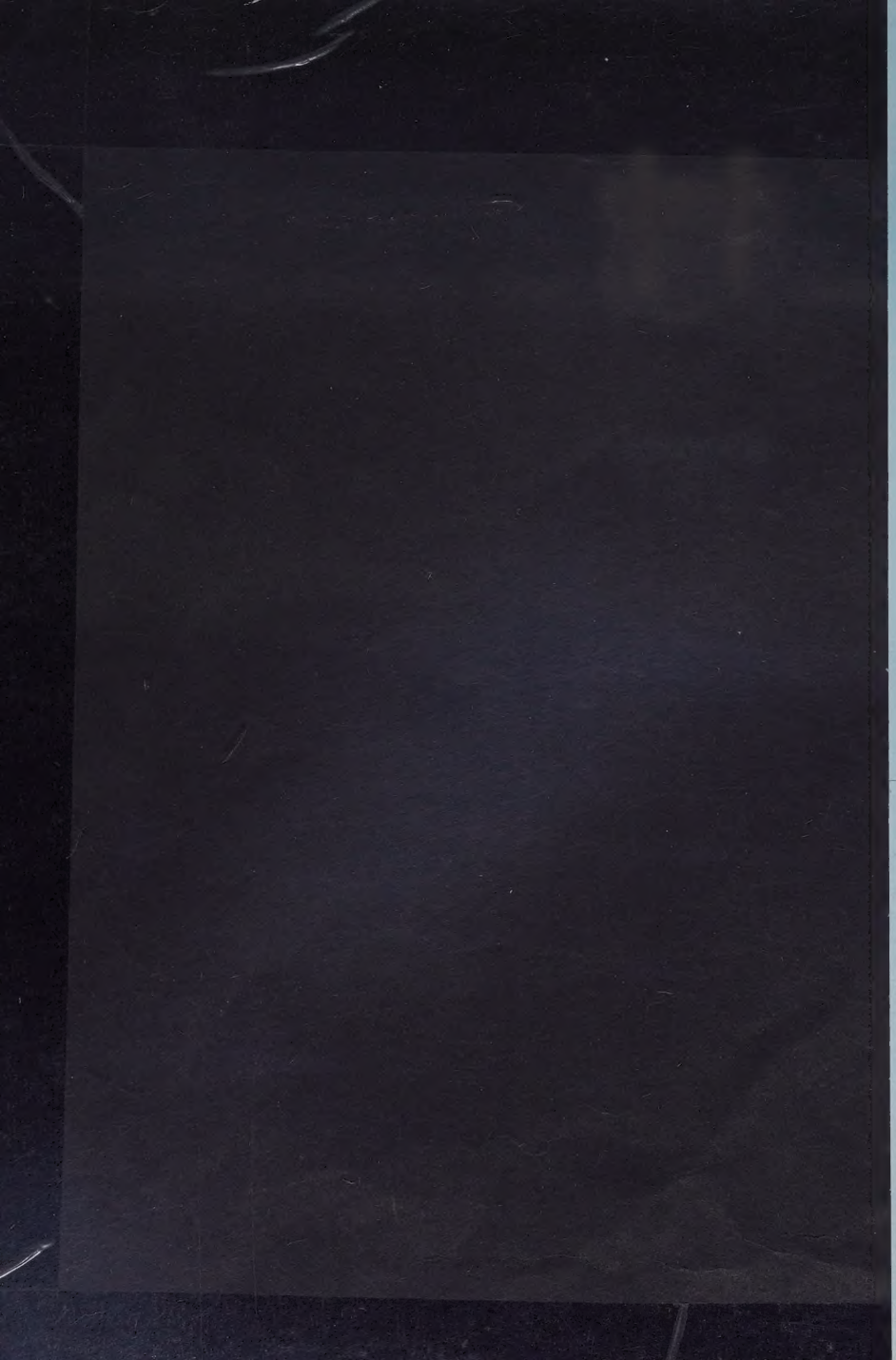

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SECTION 1

INTRODUCTION

1.1 SCOPE

1.2. This manual covers installation, operation, and maintenance information for the Dana Model 5500 Digital Voltmeter equipped with a Model 112 or Model 130 Accessory Module and designated as 5500/112 or 5500/130 (figure 1.1). All descriptions pertain to both models unless otherwise noted.

1.3. The manual is intended for use by personnel responsible for operation and/or maintenance of the equipment. The information includes the physical description, operating instructions, theory of operation, maintenance, and troubleshooting guides.

1.4 PURPOSE OF EQUIPMENT

1.5. Both models provide complete d-c capability including filtered or unfiltered voltage measurement, dc/dc ratio, and dc voltage in millivolts. Model 5500/130 provides the additional capability of resistance (in Kilohms) and ac voltage measurements.

1.6. The output is displayed on a five-digit visual readout with a sixth "overrange" digit that extends each range by 10% (99999 to 109999). An optional Remote Programming accessory enables the function, range, and read commands to be made externally. In addition, an optional Digital Output accessory provides an isolated binary-coded decimal (BCD) output for driving a printer or other recording device. Output and Programming options are described in Section 3.

1.7. Standard features of the Model 5500 are Automatic Ranging, Automatic Polarity and the Analog Output. With automatic ranging (Auto Range), circuits within the instrument determine

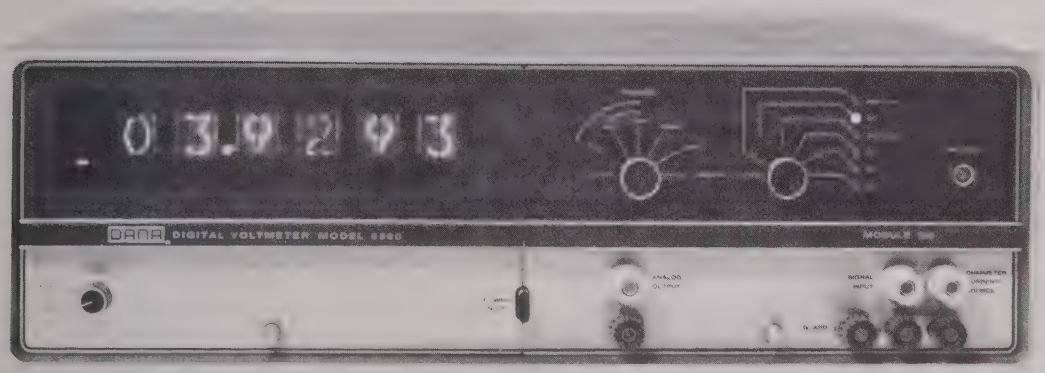


Figure 1.1. Model 5500/130 Digital Voltmeter

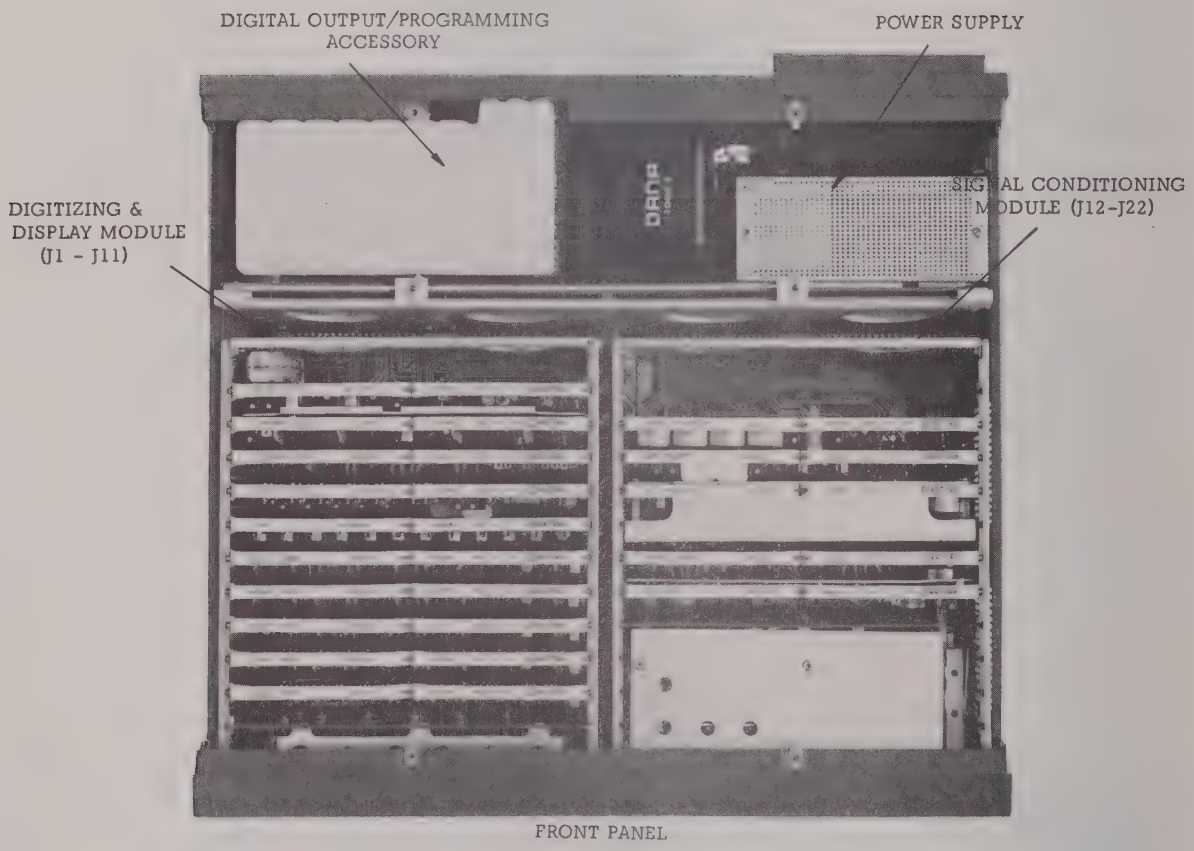


Figure 1.2. Top View - Cover Removed

Table 1.1. Connector Identification

Module 130 Connector	Function	Module 112 Connector	Function
J1	Circuit Board, Display	J1	Circuit Board, Display
J2	Circuit Board, 10,000 Decade	J2	Circuit Board, 10,000 Decade
J3	Circuit Board, 1,000 Decade	J3	Circuit Board, 1,000 Decade
J4	Circuit Board, 100 Decade	J4	Circuit Board, 100 Decade
J5	Circuit Board, 10 Decade	J5	Circuit Board, 10 Decade
J6	Circuit Board, 1 Decade	J6	Circuit Board, 1 Decade
J7	Circuit Board, DAC	J7	Circuit Board, DAC
J8	Circuit Board, Null Detector	J8	Circuit Board, Null Detector
J9	Circuit Board, Sequence Logic	J9	Circuit Board, Sequence Logic
J10	Circuit Board, Control Logic	J10	Circuit Board, Control Logic
J11	Circuit Board, Reference and Buffer Amplifier	J11	Circuit Board, Reference and Buffer Amplifier
J12	Assembly, Control and Attenuator	J12	Function Control
J13		J13	Filter and Attenuator
J14		J14	
J15		J15	
J16	Circuit Board, Isolator	J16	Circuit Board, Isolator
J17	Circuit Board, Range Control	J17	Circuit Board, Range Control
J18	Circuit Board, AC Converter		
J19			
J20	Circuit Board, Auto Polarity	J20	Circuit Board, Auto Polarity
J21	Circuit Board, Ohms Converter		
J201	Remote Programming Input (rear, optional)	J201	Remote Programming Input (rear, optional)
J202	Digital Output (rear, Optional)	J202	Digital Output (rear, Optional)
J203	Power (rear)	J203	Power (rear)
Binding Post (front panel)		Signal Input	
Binding Post (front panel)		Ohm Current Source (130 only)	
Binding Post (front panel)		Analog Output	
Binding Post (rear panel)		Reference Input	

the optimum range for the function being measured and switch to that range automatically. An automatic polarity (Auto Polarity) circuit recognizes the polarity of the input and adjusts the measuring circuits accordingly. The polarity of the input is displayed along with the value. An analog output voltage, proportional to the signal being measured, is available at terminals on the front panel of the instrument. This voltage, at ten volts full-scale (plus overrange), allows analog recordings to be made in parallel with digital measurements. Many other applications for the analog output are possible — including its use as a precision voltage source.

1.8 MECHANICAL DESCRIPTION

1.9. All circuits, except the power supply, are mounted on plug-in printed circuit boards. The boards are installed in the two DVM modules (figure 1.2). The Accessory Module, on the right-hand side of the instrument, performs all of the signal conditioning operations necessary to provide a ten-volt full scale d-c voltage (analog of the input) to the Digitizing and Display module on the left. Both modules are installed from the front of the instrument. The boards are identified in Table 1.1.

1.10. All operating controls are mounted on the front panel of the instrument. Binding posts on the front panel receive the Input Signal and deliver the Analog Output and the Ohmmeter Current Source (130 only.) On the rear panel are the power connector binding posts for the reference input, the remote program connector, and the digital output connector. Within the instrument are connectors J1 through J22 into which the circuit boards are installed. Figure 1-2 shows the location of each connector.

1.11 ELECTRICAL DESCRIPTION (Block Diagram: Figure 1.3)

1.12. The instrument uses the null balance technique to measure the amplitude of unknown voltages. The circuit boards in connectors J12 through J22 (signal conditioning circuitry) develop a ten-volt full scale (plus overrange) analog voltage of the input which may be either an ac, dc, or ohms measurement. A current, proportional to this voltage, is balanced against a precise current developed from an internal reference voltage in the digitizing and display circuits (J1-J11). The "balancing" of these currents is done by a series of trial-and-error-currents developed from the known reference voltage and compared with the current from the signal conditioner. Precision resistors in the Digital to Analog Converter (DAC) divide the reference current into 100,000 equally-spaced current increments. The closest increment is determined in a maximum of 45 trials. When a null balance has been achieved, the digital setting of the DAC is displayed on the visual readout. The number shown is the ratio of the input signal to the reference voltage in parts per 100,000.

1.13. For example, if the controls are set to measure ac volts on the 100-volt range (on 130 module), a 50-volt input (rms) results in an internal analog voltage of 5 volts dc from the signal conditioning circuits. This is converted to a current which is balanced by an equal current derived from the

internal reference voltage when the DAC arrives at a value of 50,000 (parts per 100,000). The digital display now carries the numerals 5-0-0-0-0, and range information from the signal conditioning circuits place the decimal point to read 50.000.

1.14. In the ratio measuring mode, the internal 20-volt reference is replaced by an external dc voltage, which may vary from +2 to +10.5V (ratio input of +20 to 105V optional). The displayed value is the ratio between the input signal and the reference voltage at that instant. The ratio between +dc voltages and the reference are shown as plus (+) ratios; the ratio between -dc voltage and the reference as minus (-) ratios. This bipolar ratio capability is of particular value in applications, such as bridge balancing, where inputs are likely to pass through zero. Since the signal and reference voltages are being detected simultaneously, the accuracy of the ratio measurement is independent of the stability of the voltage source.

1.15 SPECIFICATIONS

1.16. Specifications are listed in table 1.2.

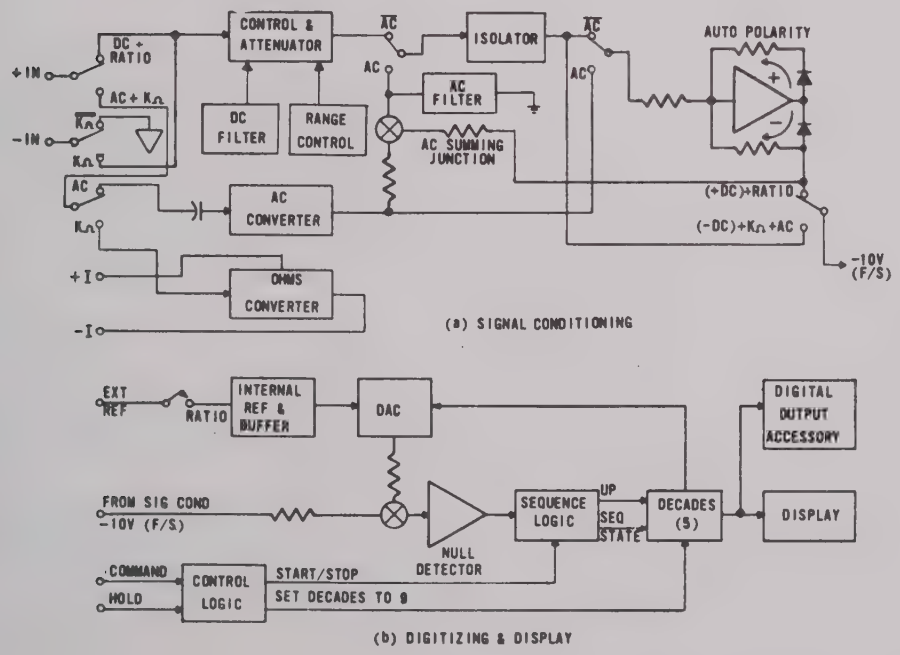


Figure 1.3. Model 5500 Block Diagram

Table 1.2. Electrical Specifications

DC VOLTAGE MEASUREMENTS	
Full Scale Ranges	±10.9999, ±109.999, ±1099.99 V (max 1000 V)
Accuracy	
Short term, 24 hours, 23 ±1°C	±0.005% of reading ± 0.001% of f.s.
Long term stability, 6 months	±0.001% of reading per month
Temperature coefficient	±0.0005% of reading ± 0.0002% of f.s. per °C
Response time: Digitizing	15 milliseconds
Digitizing with polarity change	25 milliseconds
Range change (Read Mode)	250 milliseconds per range
Full scale step function settling time (to 0.01%)	500 milliseconds with up to 100k-ohm source
Common mode rejection: DC	140 dB with up to 100 ohms in either lead
AC, 61 Hz and below	120 dB with up to 100 ohms in either lead
Normal mode noise rejection	60 dB min, 50 Hz and up; increasing 18dB/octave; 80 dB min, 300 Hz and above (55 dB min, 49 Hz and up)
Input resistance - at or off null: 10 range	10,000 megohms
other ranges	10 megohms
DC RATIO VOLTAGE MEASUREMENTS	
Full Scale Ranges	±1.09999:1, ±10.9999:1, ±109.999:1
Accuracy	
Short term, 24 hours, 23 ± 1°C	±0.004% of reading ±0.001 (10 V/ref)% of f.s.
Long term stability, 6 months	±0.0003% of reading per month
Temperature coefficient	±0.0005% of reading ±0.0002% of f.s. per °C
Response time: Digitizing	15 milliseconds
Digitizing with polarity change	25 milliseconds
Range change	250 milliseconds per range
Full scale step function settling time (to 0.01%)	500 milliseconds with up to 100k-ohm source
Common mode rejection: DC	140 dB with up to 100 ohms in either lead
AC, 61 Hz and below	120 dB with up to 100 ohms in either lead
Normal mode noise rejection	Same as absolute (input only)
Input resistance - at or off null: 10 range	Signal, 10,000 megohms; ref, 20 megohms
other ranges	Signal, 10 megohms; ref, 20 megohms
DC VOLTAGE MEASUREMENTS, FAST	
Full Scale Ranges	±10.9999, ±109.999, ±1099.9 V (max 1000 V)
Accuracy	
Short term, 24 hours, 23 ± 1°C	±0.005% of reading ±0.001% of f.s.
Long term stability, 6 months	±0.001% of reading per month
Temperature coefficient	±0.0005% of reading ±0.0002% of f.s. per °C
Response time: Digitizing	15 milliseconds
Digitizing with polarity change	25 milliseconds
Range change	250 milliseconds per range
Full scale step function settling time (to 0.01%)	50 milliseconds with up to 100k-ohm source
Common mode rejection: DC	140 dB with up to 100 ohms in either lead
AC, 61 Hz and below	94 dB with up to 100 ohms in either lead
Input resistance - at or off null: 10 V range	10,000 megohms
other ranges	10 megohms

Table 1.2. Electrical Specifications (Cont.)

MILLIVOLT MEASUREMENTS	
Full Scale Ranges	±109.999, ±1099.00 millivolts
Accuracy, 3 months: 100mV range	±0.01% of reading ±0.02% of f.s.
1000mV range	±0.01% of reading ±0.005% of f.s.
Response time: Digitizing	15 milliseconds
Digitizing with polarity change	25 milliseconds
Range Change (Read Mode)	250 milliseconds
Full scale step function settling time (to 0.01%)	1 second
Common mode rejection: DC	140 dB with up to 100 ohms in either lead
AC, 61 Hz and below	120 dB with up to 100 ohms in either lead
Normal Mode Noise Rejection:	40 dB min, 59 Hz and up increasing 12 dB/octave (360 dB min, 49 Hz and up)
Input resistance	100 megohms minimum
AC MEASUREMENTS	
Maximum voltage rating	500 V rms, 50 Hz to 10 kHz, decreasing to 150 V at 50 kHz and above
Full Scale Ranges	10.9999, 109.999, 1099.99 V rms
Accuracy, 3 months	50 Hz to 10 kHz: ±0.09% of rdg ±0.01% f.s.
	10 kHz to 50 kHz: ±0.2% of rdg ±0.05% f.s.
	50 kHz to 100 kHz: ±0.9% of rdg ±0.1% f.s.
Response time: Digitizing	15 milliseconds
Range Change (Read Mode)	250 milliseconds/range
Full scale step function settling time (to 0.1%)	300 milliseconds
Common mode rejection: AC, 61 Hz and below	94 dB with up to 100 ohms in either lead
Input resistance (all ranges)	1 megohm in series with 0.22 microfarad
Shunt capacitance at terminals	Front input: less than 140 pF; parallel rear input: less than 200 pF
OHMS MEASUREMENTS	
Maximum voltage across unknown	11 V at f.s., max current 10 mA on 1 kilohm range
Full scale ranges	1.09999, 10.9999, 109.999, 1099.99, 10999.9 kilohms
Accuracy, 3 months	
1, 10, 100 kilohm ranges	±0.01% of reading and ±0.001% f.s.
1000 kilohm range	±0.03% of reading and ±0.001% f.s.
10,000 kilohm range	±0.1% of reading and ±0.001% f.s.
Response time: Digitizing	15 milliseconds
Range Change (Read Mode)	250 milliseconds/range
Full scale step function settling time	750 milliseconds
GENERAL SPECIFICATIONS	
Measurement rate (Read Mode)	4 readings/second
Operating temperature range	0°C to 50°C; accuracy and tempco specs apply from +12° to +50°C.
Maximum power requirement	50 watts, 105 to 125 V (export 210 to 250 V), (50 to 70 Hz (400 Hz special)
Maximum common mode voltage	250 volts
Dimensions	Standard 19-inch rack width; 5-1/4" high
Guarantee	12 months, faulty workmanship or component failure

NOTE

If the DVM has been stored for a prolonged period (5 or 6 months) without use, it is recommended that it be operated with a variable transformer, such as a Variac, at one-half line voltage for about two hours before gradually applying full power. This is done to "reform" the electrolytic capacitors in the amplifier and reduce the chance of capacitor failure.

SPECIAL NOTE

The shipping carton and its internal support structure have been scientifically designed for maximum protection of the instrument. Dana recommends saving the carton and contents for use in future reshipping of the instrument. Alternate packing methods, such as plastic foam blocks and loose packing material, may prove to be insufficient for maximum protection and result in damage during shipment.

If reshipping is required and the original carton is not available, special packing instructions can be obtained from Dana Labs' Product Service Department.

SECTION 2

INSTALLATION & OPERATION

2.1 UNPACKING & INSPECTION

2.2. The Model 5500 Digital Voltmeter is crated in a plastic foam container consisting of two half-forms joined together and securely taped. The forms are contoured so as to hold the digital voltmeter firmly in place with the container absorbing any reasonable external shock. Before uncrating, examine the container for any sign of external damage. Then perform the following steps.

(a) Carefully cut the tape holding the two half-forms together and remove the digital voltmeter. Inspect the digital voltmeter for signs of damage. If damage is found, notify the carrier immediately.

(b) Remove the two modules from the DVM enclosure by turning the knurled knobs counterclockwise and pulling on the aluminum channel across the front panel of each module. Be sure that all circuit boards are firmly seated in their connectors. Normally, there is no need to remove each board; however, a visual check for obvious damage should be made.

(c) Reseat all modules by pressing them firmly into the connectors at the rear of each drawer assembly. Lock in place by turning the knurled knobs fully clockwise.

2.3. The Model 5500, as shipped, is designed for bench-top operation. A standup bracket is provided under the case to aid in reading the visual display. To adapt the Model 5500 for rack mounting, flanges are attached by removing the two screws holding the side panels to the front bezel casting and replacing them with the longer screws provided with the rack-mounting flanges. The flanges are supplied in pairs, with Part No. F-450820 applying to a pair of flanges alone. For integral flanges and carrying handles, specify Part No. FH-450820. For carrying handles only, specify Part No. H-450820.

2.4 POWER CONNECTION

2.5. An eight-foot, three-wire, power cable is supplied with the instrument. This cord connects to a three-pin power connector at the rear of the unit.

2.6 INPUT CONNECTOR

2.7. Signal input and analog output binding posts are located on the front of the digital voltmeter. Binding posts for the reference input, used for ratio measurements, are located on the rear of the unit. Connection to these terminals are made with standard "banana" plugs. Models equipped with a rear input connector, designated as Model 5500-1, use a six-pin cable connector wired in parallel with the front-panel binding posts. The mating connector is supplied with the instrument. See paragraph 2.10 for instructions on the use of the analog output. Pin assignments of the rear input connector are as follows.

Pin A	Signal Input +
Pin B	Signal Input -
Pin C	Ohmmeter Current +
Pin D	Ohmmeter Current -
Pin E	Guard
Pin F	Ext. Ref.

2.8 REMOTE PROGRAM/DIGITAL OUTPUT CONNECTORS

2.9. For pin assignments and other information necessary for installation and operation of the optional Digital Output and Remote Programming acessories, see Section 3.

2.10 ANALOG OUTPUT

2.11. The analog output at the front panel terminals is ±10 volts full scale for ±DC signals, both volts and millivolts. It is -10 volts full scale for kilohm measurements and -10 volts full scale for AC measurements.

2.12. The analog output should drive a minimum 10,000 ohm load, since the maximum, full-scale current should not exceed 1 milliampere.

2.13. In connecting the analog output to a strip-chart recorder or other analog device, it should be recognized that the black terminal of the analog output pin is connected internally to the low side of the signal input. Ideally, therefore, floating or isolated recorders should be used to avoid ground loop problems.

2.14 INITIAL CHECKOUT PROCEDURES

2.15. The following procedure is performed to verify that no damage has occurred during shipment and that the instrument is operative. Slight deviations in readings during the following tests may be corrected by making simple adjustments. For instructions refer to Section 5, "Calibration". Any major discrepancies should be reported to the carrier and to Dana Laboratories immediately.

2.15. Prior to performing the checkout procedure, it may be advisable to refer to the operating instructions beginning at 2.25.

2.16 ZERO CHECK

(a) Set FUNCTION control to MV and RANGE to 100.

(b) Short input leads. Visual readout should display 000.00.

(c) If necessary, adjust MV ZERO on front panel to obtain this reading.

2.17 POLARITY GAIN CHECK

(a) Set FUNCTION control to DC and RANGE to 10.

(b) Apply a known voltage of approximately -10 volts to the input. Visual readout should display value of input voltage (within specified tolerance) and proper polarity.

2.18 RANGE CHECK

(a) Set RANGE to 100.

(b) Connect input to a source of +100 DC.

(c) Visual readout should display input value (within specified tolerance) and proper polarity.

(d) Vary input voltage and polarity and check for proper readout.

(e) Repeat on 1000 volt range.

(f) Repeat the above steps with range on mV and using 100mV and 1000mV inputs.

2.19 AC CHECK (130 only)

(a) Connect signal generator to input. Set FUNCTION switch to AC.

(b) Set generator to 50Hz and check for proper readout (within specified tolerance) at the following input voltages: 9 volts, 90.0 volts, and 125 volts.

2.20 OHMS CHECK (130 only)

(a) Measure standard resistors of values near full scale for each range.

(b) Check for proper readout (within specified tolerance) and ohms indication.

2.21 FUSE

2.22. The power fuse is located on the rear panel of the instrument. It is a 3AG 1 Amp fuse.

2.23 EXTERNAL CONNECTOR IDENTIFICATION

2.24. All external connectors are identified in table 2.1.

2.25 CONTROLS (See Figure 2.1)

2.26 POWER SWITCH

2.27. This is a two-position switch that applies power to the instrument. When Power is ON, the DVM display is always lit.

2.28 READ/HOLD SWITCH

2.29. This is a two-position switch that allows the operator a choice of a READ mode, in which new readings are commanded at a fixed rate of four per second, or a HOLD mode, which freezes the last previous reading indefinitely. HOLD is released by turning the switch back to the READ position.

2.30 FUNCTION SWITCH

2.31. The FUNCTION switch is a seven-position switch having the following positions:

(a) REMOTE. In REMOTE, the selection of the function to be measured is made externally through the Remote Program input connector.

(b) FAST DC. This position selects high-speed, non-filtered DC measurements from 100uv to 1000 volts.

(c) DC. DC selects medium-speed dc measurements from 100uv to 1000 volts. An input filter is installed in the circuit in this position.

(d) 10X RATIO. This position selects the measurement of the ratio of the DC input voltage to a reference +DC voltage (+2 to +11V.) both applied at the input connector.

(e) AC (130 only). This position selects the measurement of AC voltages from 100uv to 1000V (rms) at 50Hz to 100kHz.

Table 2.1. External Connector Identification

Connector	Dana P/N	Mfr.	P/N
Digital Output J202	600017	Amphenol	57-40500
Mating Connector	600047	Amphenol	57-30500
Rear Input J203	600259	Amphenol	97-3102A-14S-6S-639
Mating Connector	600260	Amphenol	97-3106A-14S-6P-639
Hood	601639	Amphenol	97-3057-6A-639
Remote Programming J204	600017	Amphenol	57-40500
Mating Connector	600047	Amphenol	57-30500

(f) MV. This position selects the measurement of low-level DC voltages from 1 microvolt to 1000 millivolts.

(g) K-OHM (130 only). This position selects the measurement of resistance from 0.1 ohm to 10 megohms.

2.32 RANGE SWITCH

2.33. The RANGE switch has five fixed range positions, an AUTO position and REMOTE.

(a) Fixed Ranges. The five fixed ranges are 1, 10, 100, 1000, and 10,000. Inscriptions on the panel define the ranges which can be used with particular functions. AC, DC, and FAST DC measurements can be taken on the 10, 100, and 1000 volt ranges. Millivolts can be measured on the 100 and 1000 ranges. Resistance can be measured on all five ranges. If a range is selected that is invalid for the function being measured, the instrument advances to the 1000 range whether or not there is an input. For example, if 10000 is selected in MV function, the range advances to 1000. When this happens, the decimal point on the readout is blank indicating incorrect data.

(b) AUTO (Automatic). In this position, range is automatically selected for all functions by internal circuits.

(c) REMOTE. In this position, the selection of range is made externally through the Remote Program input.

2.34 MANUAL OPERATION

2.35. Once the instrument has been connected to the power line and to the signal source in accordance with the instructions in 2.3 through 2.13, the operator can make all the required measurements by setting the front panel manual controls to the indicated positions. Remote program operation is covered in Section 3. The voltmeter displays the four-per-second readings in the READ mode. It is therefore normally most convenient to leave the READ/HOLD control on the READ position, using the HOLD position only for special applications, such as remote

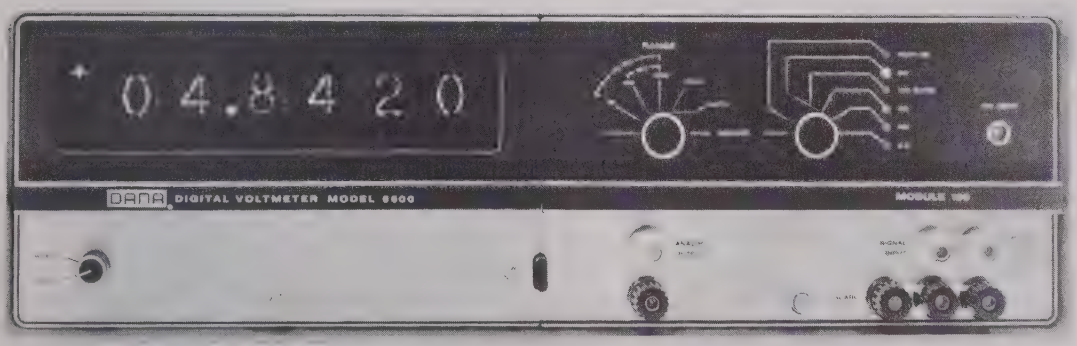


Figure 2.1 Model 5500 Control Panel

command operation. When switching from one type of measurement to another by turning the FUNCTION control, it is generally advisable to keep the RANGE switch on AUTO so as to avoid overloading the input circuitry.

> CAUTION
>
> Voltage exceeding 250 volts must not be applied between chassis ground and guard or between guard and the low input terminal. Avoid introducing more than 500 volts into the instrument while the FUNCTION switch is on AC or more than 30 volts while the FUNCTION switch is on MV.

2.36 DC MEASUREMENTS, FAST, NORMAL AND MILLIVOLT

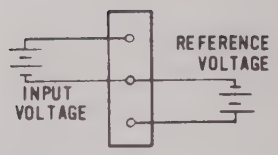
2.37. Attach the high side of the signal source to the white signal input terminal and the low side to the black signal input terminal. Connect guard to the low side of the measurement point.

2.38 AC MEASUREMENTS

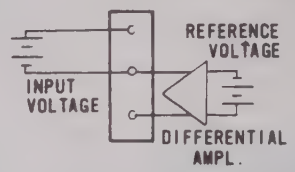
2.39. Attach the high side of the signal source to the white signal input terminal, the low side to the black signal input terminal. Connect guard to the low side of measurement point.

2.40 RATIO MEASUREMENTS

2.41. Attach the signal input as for DC measurement. Attach the +DC reference voltage with the positive side to the white EXT REF terminal at rear of instrument and the negative side to the black EXT REF terminal. The instrument by itself makes three-wire ratio measurements since the signal and reference



(a) Three-Wire Ratio Measurements



(b) Four-Wire Ratio Measurements

Figure 2.2. Ratio Connections

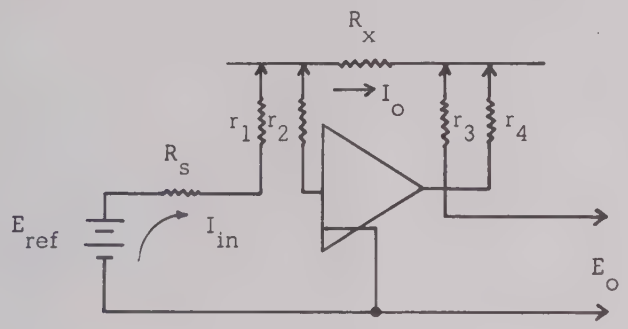
voltage have a joint common (see figure 2.2). For four-wire ratio measurements, an external differential amplifier (such as the Dana Model 2820) must be used. The amplifier can be placed in either the signal or reference input, depending on application.

2.42 OHMS MEASUREMENTS (130 Module Only)

2.43. For two-wire ohms measurements, jumper the white (+) ohmmeter current source terminal to the white (+) signal input terminal and the black (-) ohmmeter current source terminal to the black (-) signal input terminal. The unknown resistance may be connected across either set of terminals.

2.44. For four-wire ohms measurements, separate sets of leads are connected to the non-jumpered signal input and ohmmeter-current source terminals. These leads are connected to the unknown resistance in the manner shown in figure 2.3b.

Table 2.2. Four-Wire Operational Ohmmeter



Applies to Ohms Converter Assembly 402551 only.

$$I_{in} = \frac{E_{ref}}{R_s}$$

(r_1 through r_4 = lead resistance)

Since $I_{in} = I_o$, $E_o = \frac{E_{ref} R_x}{R_s}$ and $\frac{E_o}{E_{ref}} = \frac{R_x}{R_s}$

Analysis of Lead Resistance

Lead resistances r_2 and r_3 have no effect since there is no current flow through them. Resistance r_4 is eliminated by being placed within the feedback loop. This is accomplished by proper placement of the voltage sensing lead (r_3).

Resistance r_1 affects the full scale current. Therefore, it causes a "percent of reading" error equal to:

$$\frac{R_1 \times 100}{R_s} \quad \% \quad \text{where } R_s = \text{Standard Resistor}$$

For example, if r_1 is 1 ohm and the standard resistor is 2K, the % of reading error is 0.05%.

It is important to note that r_1 has no effect at zero resistance and does not cause a % of full-scale error. For example, using the two-wire method, a lead resistance of 1 ohm creates an error of 1% when measuring 100 ohms (R_x).

If lead resistance is changed, a full scale adjustment must be made to maintain full accuracy.

2.45. (Applies to Ohms Converter Assembly 402551 only). The four-wire configuration minimizes the effect of lead resistance. However, when the four-wire ohms measurement is used, the full scale reading must be re-adjusted (by recalibration of the Ohms Converter with the cables to be used for measurement). No zero adjustment is required. See Table 2.2 for analysis of lead resistance.

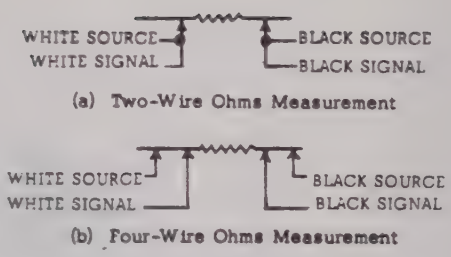


Figure 2.3. Ohms Measurement

SECTION 3

DIGITAL OUTPUT AND REMOTE PROGRAM ACCESSORIES

3.1 INTRODUCTION AND OPTIONS

3.2. The isolated accessories available for use with the Dana Model 5500 Digital Voltmeter allow operation with non-isolated equipment with no loss in the common-mode characteristics of the voltmeter. This is achieved by the use of guarded reed relays between the instrument and all external input/output lines. The basic accessories and their identifying model numbers are listed below:

Isolated Digital Output Model 76

Isolated Remote Program Model 77

Isolated Digital Output/Isolated Remote Program Model 78

3.3. The isolated output can be adapted to the format requirements of a wide variety of printers and other digital output devices by use of a diode matrix which converts the internal digital voltmeter code to the desired BCD output. The more commonly used codes (1-2-4-8 and 1-2-2-4) have been standardized and assigned option numbers. Other BCD codes can be provided on special order.

3.4. Output voltage levels are produced by a switch closure to an externally supplied reference voltage. The user can, therefore, obtain the desired voltage levels by specifying either a switch-closure for a "false" bit or a switch-closure for a "true" bit. An open switch, of course, represents the complementary state. With contact-closure "true" specified, negative true outputs are obtained when a positive reference voltage is supplied; positive true outputs are obtained when a negative reference is supplied. With a contact-closure "false", the output sense is reversed.

3.5. The options described above are designated by a suffix to the basic accessory model number:

1-2-4-8 with switch-closure "true" is designated as D1.

1-2-4-8 with switch-closure "false" is designated as D2.

1-2-2-4 with switch-closure "true" is designated as E1.

1-2-2-4 with switch-closure "false" is designated as E2.

3.6. For example, a Model 5500 DVM having basic accessory Model 78 with 1-2-4-8 code, switch-closure, "true" is identified as 5500-78-D1.

3.7. Physically, each basic accessory consists of a printed circuit "motherboard" containing nine connectors into which additional printed circuit boards are placed. The nine connectors are designated as J211 through J220. Four types of boards are used; the quantity of each is determined by the basic accessory model. The complement of each type board in each basic accessory is shown in table 3.1. Separate

Table 3.1. Board Types

Basic Accessory	Isolated Output Boards					Isolated Programming Boards		Range & Funct. Code Board	Com'd Logic Board	Delay Board
	J211	J212	J213	J214	J215	J216	J217	J218	J219	J220
Model 76	X	X	X	X	X		X	X	X	
Model 77					X	X	X		X	X
Model 78	X	X	X	X	X	X	X	X	X	X

sets of diode matrices are installed in the decade boards and in the output accessory to obtain the proper BCD output for the specified option.

3.8. The digital outputs of each accessory are delivered through connector J202; program inputs are made through J204. The connectors are mounted on the accessory at the rear panel of the DVM. Specific pin assignments of the connectors are listed on the pin assignments charts, Table 3-3 (page 3-6) and Table 3-6 (page 3-9).

3.9 ISOLATED OUTPUT BOARD (J211 through J215)

3.10. The Isolated Output circuit boards are used in basic accessories 76 and 78 only, since Model 77 does not deliver an electrical output. The boards contain guarded reed relays that provide isolation between the digital voltmeter circuits and the output device. They also contain diode matrices to convert polarity and overrange information into the desired BCD output format. The configuration of a typical output bit (X1) is shown in Figure 3.1.

3.11. When the X1 input from the DVM digitizing circuits is at digital common, relay K1 is energized. This places the X1 output at common. When K1 is not energized, the voltage at the X1 output is dependent on the external supply voltage. Relay K1 is energized on either the "true" or "false" DVM outputs depending on the option selected and determined by the diode matrix in the Decades of the digital voltmeter.

3.12 ISOLATED PROGRAMMING BOARD (J216 - J217)

3.13. The configuration of a typical Isolated Programming input circuit is shown in Figure 3.2. Two boards are used in Models 77 and 78; one board (J217) is used in Model 76.

3.14. The command for a function or range selection is made by supplying a common to the appropriate pin on the Programming Input connector. One side of each programming relay is tied to one side of each of the other relays and to the external +12 volt supply supplied by user.

3.15. Current flow through a closed circuit is approximately 6 milliamperes.

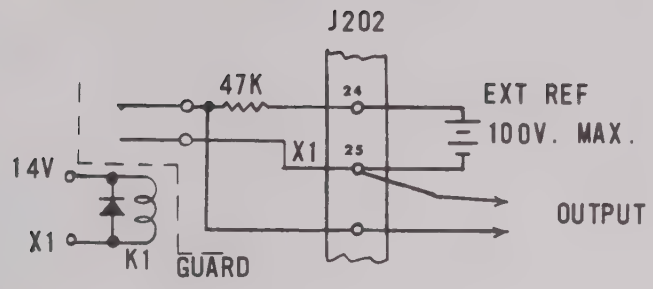


Figure 3.1. Typical Output Circuit

3.16 RANGE/FUNCTION CODE BOARD (J218)

3.17. The Range/Function Code board contains two diode matrices. One is used to convert the internal DVM function code to the selected output format; the other matrix converts the internal DVM range code to the selected output format. Specific coding differs with the option selected. The codes are identified on the "Pin Assignments" chart for the particular accessory.

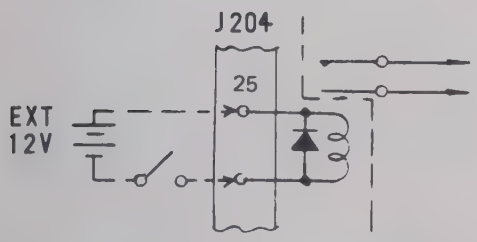


Figure 3.2. Typical Program Input

3.18 COMMAND LOGIC BOARD (J219)

3.19. The Command Logic Board used in the Model 76 options, provides an approximate 1 ms delay for the print drive signal. The Command Logic Board used in the Models 77 and 78 options, is used in conjunction with the Delay Board (J220). These two boards, provide a delay or "timeout" period to provide settling time for the input accessories (used with AC, DC, Kilohms, or MV measurements) and to allow time for the DVM to change ranges when operating in Auto Range. At the end of the delay period, a Print Command is generated.

3.20. A simplified diagram of the Command Logic and delay circuitry is shown in figure 3.3. This general configuration is used with Models 77 and 78. A simplified block diagram of the Print Command logic used in the Model 76 options is shown in figure 3.4.

3.21 DVM COMMAND

3.22. The DVM Command is applied to the instrument causing a new read-

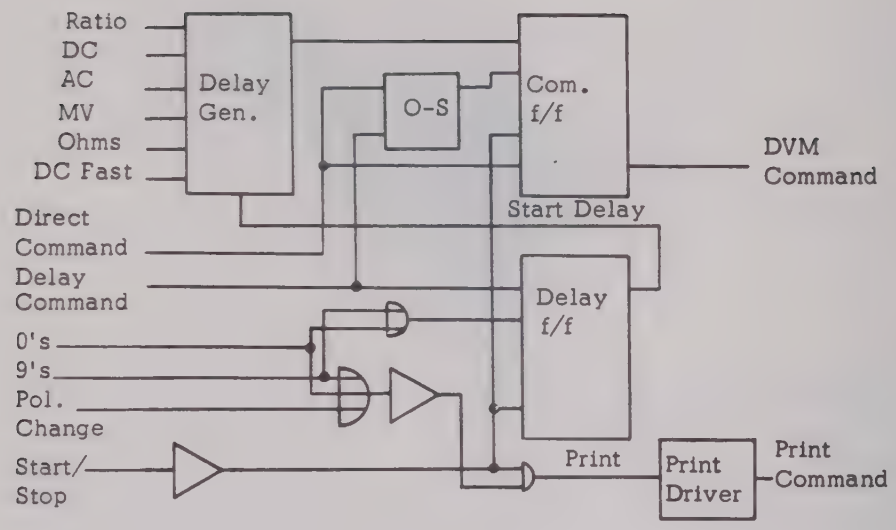


Figure 3.3. Block Diagram - Delay Circuit

ing to be taken. The command is initiated on the negative-going edge of a positive pulse generated by the Command flip-flop. The flip-flop is set true by either the Direct Command or an inverted start stop strobe pulse generated at the end of a DVM read cycle. The flip-flop is reset by the delayed output of the one shot (initiated by either the direct or delay command) or the delayed pulse of the delay generator. The Delay Generator provides various timeouts to allow for the settling time of the accessory selected (see table 3.2). The delay determining portion of the circuit is located on the Delay Board. The Delay starts when the delay flip-flop is set true by the Delay Command or by the 0's and 9's signals from the decades indicating that either the up or down range change is required. The Delay flip-flop is then reset by the start-strobe.

Type of Measurement	Delay
DC Volts - Fast	105 ms
Ratio	630 ms
DC Volts	630 ms
AC Volts	460 ms
Millivolts	1.25 sec
Ohms	890 ms

Table 3.2. Delay Times

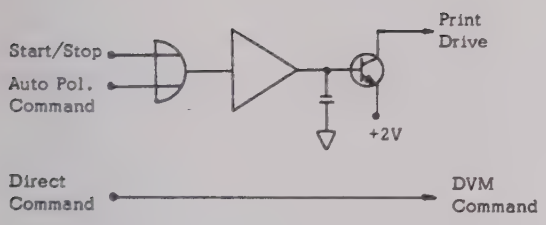


Figure 3.4. Print Command Logic

3.23. The Print signal indicates that the instrument has completed the read cycle. The Print is taken from the inverted start-stop strobe signal and extended approximately 1 millisecond by the Print Drive circuit on the Delay Board. The Print signal is inhibited during a range and polarity change.

3.24 DIGITAL OUTPUT CONNECTIONS

3.25. Pin assignments of the Digital Output connector, J201, are given in Table 3.3. The outputs include data from each decade (units through 100,000) range, polarity, and function. Each output consists of four bits, X1 through X4, representing 1-2-2-4 or 1-2-4-8 depending on the option. The BCD output format for each option is shown in Table 3.4. The table also includes sample data outputs. Outputs are obtained by supplying an external reference voltage as described below.

3.26 EXTERNAL VOLTAGE SUPPLY

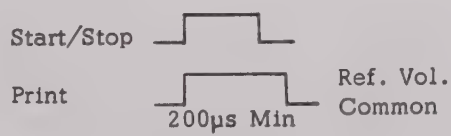
3.27. The external reference supply of up to 100 volts is applied across pins 24 and 25 of J202. This voltage is present at each individual output pin when the corresponding relay contacts are open (Figure 3.). This will occur on either a true or false bit, depending on the option selected.

3.28. The common sides of each pair of relay contacts are normally tied together. However, the commons for each group can be brought out separately (as explained in 3.33) if so desired.

3.29. Polarity bits X2, X3, and X4 are either permanently strapped to common or tied (through 47K ohm resistors) to the reference voltage, depending on option.

3.30 PRINT COMMAND

3.31. The Print line, pin 23 indicates to the printer that the data present at the output connector is final data (the measurement cycle has been completed) and that it is time to print. During the measurement cycle, the printer is inhibited from printing the interim data values by a voltage level on this line. At the end of the measurement cycle, the level changes providing the print command (Figure 3.5). The signal can be of either polarity. The voltage is the external reference voltage in series with 47K resistor.



PRINT Command is a contact closure at the completion of the read cycle. The contact is open during the read cycle.

Figure 3.5. Print Command

Table 3.3
Digital Output
Connector J202

Output		Pins		Output	
Range	X1	1	26	Range	X3
Range	X2	2	27	Range	X4
Polarity	X1	3	28	Polarity	X3
Polarity	X2	4	29	Polarity	X4
Units	X1	5	30	Units	X3
Units	X2	6	31	Units	X4
10's	X1	7	32	10's	X3
10's	X2	8	33	10's	X4
100's	X1	9	34	100's	X3
100's	X2	10	35	100's	X4
1000's	X1	11	36	1000's	X3
1000's	X2	12	37	1000's	X4
10K's	X1	13	38	10K's	X3
10K's	X2	14	39	10K's	X4
100K's	X1	15	40	100K's	X3
100K's	X2	16	41	100K's	X4
Function	X1	17	42	Function	X3
Function	X2	18	43	Function	X4
		19	44	Range Common (2)	
100K's Common (1)		20	45	Polarity Common (2)	
Function Common (1)		21	46	Units Common (2)	
		22	47	10's Common (2)	
Print Command (1)		23	48	100's Common (2)	
External Ref (1)		24	49	1000's Common (2)	
Common (1)		25	50	10K's Common (2)	

(1) Model 76 equipped with these lines only

(2) See paragraph 3.33

Mating Connector:

Dana P/N 600047 - Amphenol 57-30500

D1 - D2 OPTIONS												
BCD 1-2-4-8	D1 Switch Closure = True (1) D2 Switch Closure = False (0)											
J202 Pin No. →	1	2	26	27	17	18	42	43	3	4	28	29
Range 1	0	0	1	0								
Range 10	1	1	0	0								
Range 100	0	1	0	0								
Range 1000	1	0	0	0								
Range 10000	0	0	0	0								
DC					1	0	0	0				
Ratio					0	1	0	0				
DC Fast					1	1	0	0				
AC					0	0	1	0				
MV					1	0	1	0				
Kilohms					0	1	1	0				
+ Polarity									0	0	0	0
- Polarity									1	0	0	0
Code	1	2	4	8	1	2	4	8	1	2	4	8

TRUTH TABLE								
	D Options				E Options			
DEC.	1	2	4	8	1	2	2	4
0	0	0	0	0	0	0	0	0
1	1	0	0	0	1	0	0	0
2	0	1	0	0	0	1	0	0
3	1	1	0	0	1	1	0	0
4	0	0	1	0	0	1	1	0
5	1	0	1	0	1	1	1	0
6	0	1	1	0	0	0	1	1
7	1	1	1	0	1	0	1	1
8	0	0	0	1	0	1	1	1
9	1	0	0	1	1	1	1	1

E1 - E2 OPTIONS												
BCD 1-2-2-4	E1 Switch Closure = True (1) E2 Switch Closure = False (0)											
J202 Pin No. →	1	2	26	27	17	18	42	43	3	4	28	29
Range 1	0	1	1	0								
Range 10	1	1	0	0								
Range 100	0	1	0	0								
Range 1000	1	0	0	0								
Range 10000	0	0	0	0								
DC					1	0	0	0				
Ratio					0	1	0	0				
DC Fast					1	1	0	0				
AC					0	1	1	0				
MV					1	1	1	0				
Kilohms					0	0	1	1				
+ Polarity									0	0	0	0
- Polarity									1	0	0	0
Code	1	2	2	4	1	2	2	4	1	2	2	4

D1 - D2 OPTIONS - SAMPLE DATA VALUES																								
	100,000				10,000				1,000				100				10				UNITS			
J202 Pin No. →	15	16	40	41	13	14	38	39	11	12	36	37	9	10	34	35	7	8	32	33	5	6	30	31
Decimal 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
000001	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
000007	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0
000014	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0
000101	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0
001246	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	1	1	0
010999	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	1	1	0	0	1	1	0	0	1
104655	1	0	0	0	0	0	0	0	0	0	1	0	0	1	1	0	1	0	1	0	1	0	1	0
Code	1	2	4	8	1	2	4	8	1	2	4	8	1	2	4	8	1	2	4	8	1	2	4	8

E1 - E2 OPTIONS - SAMPLE DATA VALUES																								
	100,000				10,000				1,000				100				10				UNITS			
J202 Pin No. →	15	16	40	41	13	14	38	39	11	12	36	37	9	10	34	35	7	8	32	33	5	6	30	31
Decimal 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
000001	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
000007	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1
000014	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0
000101	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0
001246	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	1	1	0
010999	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	1	1	0	0	1	1	0	0	1
104655	1	0	0	0	0	0	0	0	0	0	1	0	0	1	1	0	1	0	1	0	1	0	1	0
Code	1	2	4	8	1	2	4	8	1	2	4	8	1	2	4	8	1	2	4	8	1	2	4	8

Table 3.4. Output Format and Codes

3.32 DIGITAL OUTPUT COMMONS

3.33. As shown on the basic schematic of the Digital Output circuits (430487 or 430489), the commons for each group of outputs are tied together. If it is desired to isolate any or all groups of outputs, it is necessary to move the factory-installed jumpers to the appropriate pins. The terminals at which the jumpers are installed are physically located on the "mother board" and are identified on the interconnection drawings (430593 and 430594). The jumper terminals are listed in Table 3.5. To isolate any output, remove the factory-installed jumper at the terminals listed in column 3 and install jumpers at the terminals listed in column 4.

3.34 REMOTE PROGRAM OPERATION

3.35. With the Remote Program accessory, the instrument can be operated by remote contact closures or by a combination of front-panel manual controls and remote contact closures.

3.36. Table 3.6 provides a list of pin assignments of the instructions that may be programmed at J204, the Remote Program connector. In order to operate the isolated relays, it is necessary to connect an external +12 volts to pin 25 of J204 (see Figure 3.3). An instruction is transmitted into the instrument by providing a common (to the externally supplied +12 volts) at the pin corresponding to the desired command (identified in Table 3.6). The instruction is not operative, however, unless the corresponding manual control on the front panel is set to its REMOTE position. Therefore, to remotely program the range, the RANGE control must be set to REMOTE. The same is true of the FUNCTION control, if the function is to be remotely programmed. It is possible, however, to set one control manually while another is being remotely controlled.

3.37. Each Accessory includes a pin for commanding the instrument to take a reading. To enable this command function, the instrument is put in the

Table 3.5. Common Jumpers

(1) J202 Pin	(2) Function	(3) Jumpers Installed	(4) Jumpers for Isolation
21	Function Common	E2 - E10	E10 - E20
50	10,000's Common	E8 - E11	E11 - E19
49	1000's Common	E9 - E12	E12 - E23
48	100's Common	E7 - E13	E13 - E24
47	10's Common	E5 - E14	E14 - E25
45	Polarity Common	E4 - E16	E16 - E27
46	Units Common	E3 - E15	E15 - E26
44	Range Common	E1 - E18	E18 - E21
20	100,000's Common	E6 - E17	E17 - E22

Table 3.6
Remote Program
Connector J204

Command	Pin
1 Range	1
10 Range	2
100 Range	26
1000 Range	27
10K Range	3
Ratio	5
DC Fast	6
DC	7
AC	29
MV	30
Kilohms	31
Hold (1)	32
Command (1)	8
Delayed Command	9
+ 12 Volts (1)	25
(1) Model 76 equipped with these lines only	
Mating Connector: Dana P/N 600047 Amphenol 57-30500	

Hold mode, either by turning the front panel READ-HOLD control to the HOLD position or by providing a command (common) to pin 32 (Hold). A single reading can then be commanded by a common to pin 8 (command). The instrument immediately initiates a measurement cycle, and holds this measurement until the common at pin 8 is broken and again made.

3.38. The delays listed in Table 3.2 are obtained by applying a common to pin 9, the Delayed Command, rather than pin 8 which provides no internal delay.

3.39 GENERAL PROGRAMMING RULES

(a) Commands (contact closures) must be 3 milliseconds (min.) duration.

(b) The range and function relays require approximately 25 milliseconds to switch. Therefore, after the function and range selections are made, 25 milliseconds should be allowed before application of the input signal.

(c) If the Read Command is made at the Direct Command input (pin 8) rather than the Delayed Command input (pin 9), a delay equal to that in Table 3.7 must be provided if the range, function, or input signal have been changed.

(d) If no remote range selection is made and the Range switch on front panel is on REMOTE, the instrument is in Auto Range.

Table 3.7. Settling Time

Function	Settling Time
DC Volts Fast	50 milliseconds
Ratio	500 milliseconds
DC Volts	500 milliseconds
AC Volts	300 milliseconds
Millivolts	1 sec
Ohms	750 milliseconds
These are settling times only. Table 3.2 lists the automatic timeout periods taken when using the delayed command. Times in Table 3.2 include settling time plus tolerances of components.	

(e) With the instrument on Auto Range and the Direct Command input used, the Command (closures) must not exceed 25 milliseconds.

3.40 GENERAL PROGRAMMING PROCEDURE

3.41. The following procedures assume that the connections to the measurement points are made as described in 2.34 through 2.45.

(a) Place instrument into HOLD mode either by setting the front panel MODE switch to HOLD or by applying a closure to common at pin 32 of J204.

(b) Apply closures to common at the pins corresponding to the desired function and range. For example, AC volts on the 100-volt range is commanded by closures to common at pins 26 and 29. If Auto Range is desired, do not select any range.

CAUTION: If the selected function was changed from the previous measurement, the input voltage should not be applied for 25 milliseconds. If the previous measurement was, for example, MV, 100 volts AC may damage the input circuits if applied before the relays are completely switched.

(c) If function was changed, allow 25 milliseconds for relay operation, then apply input signal. Command a Delayed Read by completing a closure to pin 9. If the command is made at the direct Command input (Pin 8), the Read must be delayed by the settling time of the function being measured (see Table 3.7). At the end of the measurement cycle, the print signal appears at pin 23 of J202 and the instrument will accept another command.

NOTE: When used in a system such as a scanner where the inputs are the same function, it may be more convenient to select the function and range manually and use only the Print and Read Command lines remotely. Upon receipt of the Print Command, the external system itself may generate the next Read Command.

3.42 MV/DC AND AC/DC RATIOS

3.43. The programming accessory enables the measurement of MV/DC and AC/DC ratios not possible with manual operation.

(a) Select desired range by applying a closure to common at the appropriate pin. Select ratio by applying common at pin 5.

(b) Select the numerator of the ratio (MV or AC) by a common to pin 30 or 29, respectively. Wait 25 milliseconds and apply the input signal. No delay is necessary in application of the reference input. Apply a common to pin 9, the Delayed Command — or provide a delay for settling time of the function and apply a common to the Direct Command input, pin 8.

3.44. The instrument will now measure the selected ratio and display or print a number equal to ten times the ratio.

SECTION 4

THEORY OF OPERATION

4.1 INTRODUCTION

4.2. Theory of operation of the Model 5500 digital voltmeter is described in two parts. First, the Signal Conditioning module is described; then, the Digitizing and Display module. The purpose of the Signal Conditioning module is to supply a negative 10-volt full scale input signal to the Digitizing and Display module. The Digitizing and Display module measures this input by balancing it against a current derived from a known fraction of a fixed reference voltage.

4.3. The signal conditioning circuits are described individually, followed by a discussion of operation of the signal conditioning circuits for each mode (type of measurement). Overall operation of the digitizing and display module is then described since it is the same in all operating modes. This is followed by a description of the individual circuits in the module.

4.4. The last two figures in this section are functional intraconnection diagrams of the signal conditioning module (Figure 4.10) and the digitizing and display module (Figure 4.11). Each of the diagrams can be unfolded allowing the diagram to be referenced while reading the circuit descriptions throughout the section. The diagrams are intended to supplement the complete schematics included in Section 6. Dana logic symbols are defined in Figure 4.1.

4.5 SIGNAL CONDITIONING

4.6 CONTROL AND ATTENUATOR (Module 130, Schematic 430705)

4.7. The Control and Attenuator is the first assembly behind the front panel. On it are mounted the front panel switches and input/output terminals. The board contains relays that switch the function and range displays; filters; scaling resistors; and a feedback attenuator for millivolt measurements. The relays are controlled by the function selection — from either the front panel switch or through remote programming -- and by the range signals -- from either the RANGE switch, through remote programming, or from the Range Control board.

4.8. Eight relays, K1 through K8, are used. One side of each relay coil is tied to +28V; the relay is energized by applying a digital common level to the opposite side. The purpose of each relay is indicated in the following table.

Relay	Energized By	Purpose
K1	AC Selected	Switches high side of input directly to AC Converter: switches filter into the circuit.
K2	R1 and R2 or Kilohms Selected	Range Switching
K3	MV Selected	Switches passive filter into circuit, adds feedback loop to isolator and adds resistance network to common.
K4	R1 and R2 and Kilohm Selected or AC Selected	Range Switching
K5	AC Selected	Switches Auto Polarity Output to AC Filter
K6	Kilohm, Ratio, or DC Selected	Switches active filter into input circuit when "fast" function not selected.
K7	Kilohms Selected	Routes "current source" directly from Ohms Converter
K8	Kilohm Selected	Prevents leakage of current source through relay interconnections.

4.8-1 CONTROL AND ATTENUATOR (Module 112)

4.8-2. In Module 112, the circuits that perform the above functions are separated onto two separate boards. The first, in location J12, is the Function Control. The second, the Filter and Attenuator, is installed in J15. Schematics for these boards are 430639 and 430638, respectively. The function control assembly contains the function and range switches and logic gates to interpret the function and range signals. The output of the gates are sent to the Filter and Attenuator board where the function and range relays are located. Also located on the Filter and Attenuator are the range attenuator resistors, the active DC filter, and the passive filter for millivolts. Relay assignments of the Filter and Attenuator in the Model 112 are given below.

Relay	Energized by	Purpose
K1	Ratio or DC Selected	Switches active filter into input circuit.
K2	MV Selected	Switches passive filter into circuit, adds feedback loop to Isolator, and adds resistance network to common.
K3-K4-K5	Range Selection	Range Switching

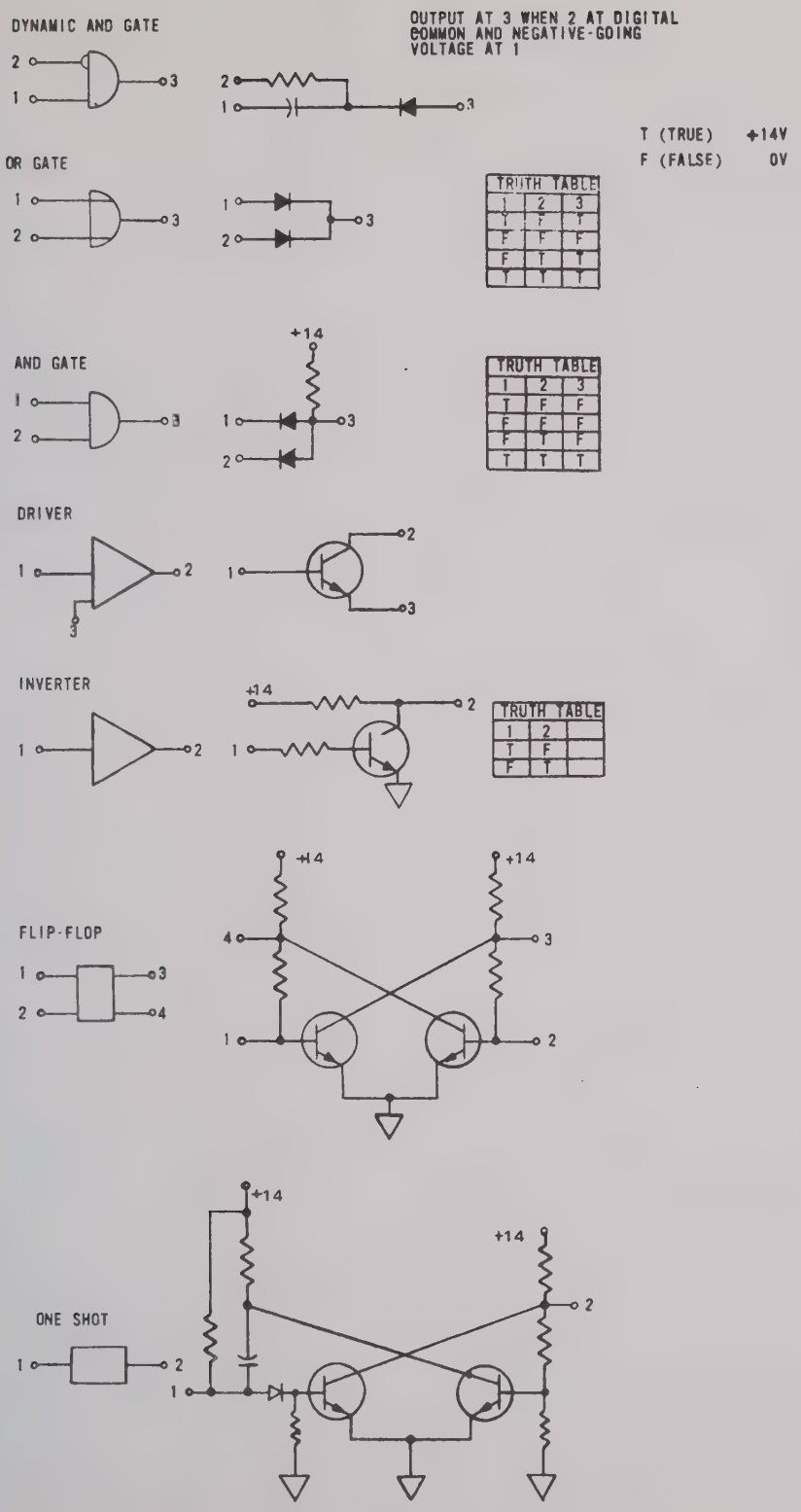


Figure 4.1. Dana Logic Symbols

4.9 ISOLATOR (Schematic 430659)

4.10. The Isolator is a floating-input potentiometric amplifier capable of operating at very low signal levels. The feedback loop, that establishes amplifier gain, is located on the Control and Attenuator board. The feedback circuit and the amplifier input are switched into various configurations to conform to the function selected. The amplifier operates as a unity-gain isolator for DC, ratios, and resistance measurements, as a gain of 10 amplifier for AC measurements; and as a preamplifier for millivolt measurements on the 100 and 1000 ranges.

4.11. Operating in conjunction with the Isolator amplifier is a "bootstrap" amplifier (consisting of Q1, Q3, Q4, Q7, Q8, Q9, and Q11, see schematic). This amplifier samples the voltage at the negative feedback point and adjusts the supply voltages to the input stage so that base and collector voltage remain constant. Also it provides a reference level for the first stage base current compensation network.

4.12 RANGE CONTROL (Schematic 430408)

4.13. Range changes in the instrument are determined by the BCD state of the Decades in the Digitizing and Display Module and controlled by the range signals R1, R2, R3, and their complements. These signals are the outputs of a three-stage counter on the Range Control circuit board. The counter counts up or down in response to logic at the input which depends on the function selected. If the decades are not at full scale (109999), the Count Up signal is inhibited by the lines from the Decades. If the state of the decades is not at one-tenth scale or less (010000), the Count Down signal is inhibited. The circuit arrangement of the inhibit lines is shown in Figure 4.2.

4.14. The Count Up and Count Down lines are clamped by diode gates on the decades when a change (either up or down) in the range counter is to be inhibited. An "up" range is allowed only when the Overflow flip-flop on the Control Logic board is set and the four lower-order decades are at nine—indicating 109999. In addition to this count, an "up" from the Trigger flip-flop is also required. At any count other than 109999, the Count Up signal is clamped to common by one or more of the diodes in the 0's or 9's gates on the Decade boards or diodes on the Overflow flip-flop output.

4.15. A "down" range is allowed only when the count is less than 01000. This is indicated by the Overflow flip-flop "off" and the 0's gate from the 10K decade "true". At other counts, the Count Down range signal is inhibited.

4.16. The count lines are also inhibited (clamped to common) by diodes on the Auto Polarity board during a polarity change.

4.17. The Count Up Range and Count Down Range signals have no effect on the counter except when the output of the Start/Stop Memory (S/S) one-shot is "true". This occurs when the S/S signal (generated in the Digitizing and Display module) goes "false" at the end of a digitizing process. The count signals can be inhibited also by the "forbidden range" logic explained in the following paragraphs. Normally the counter will count up as shown in the followirg table.

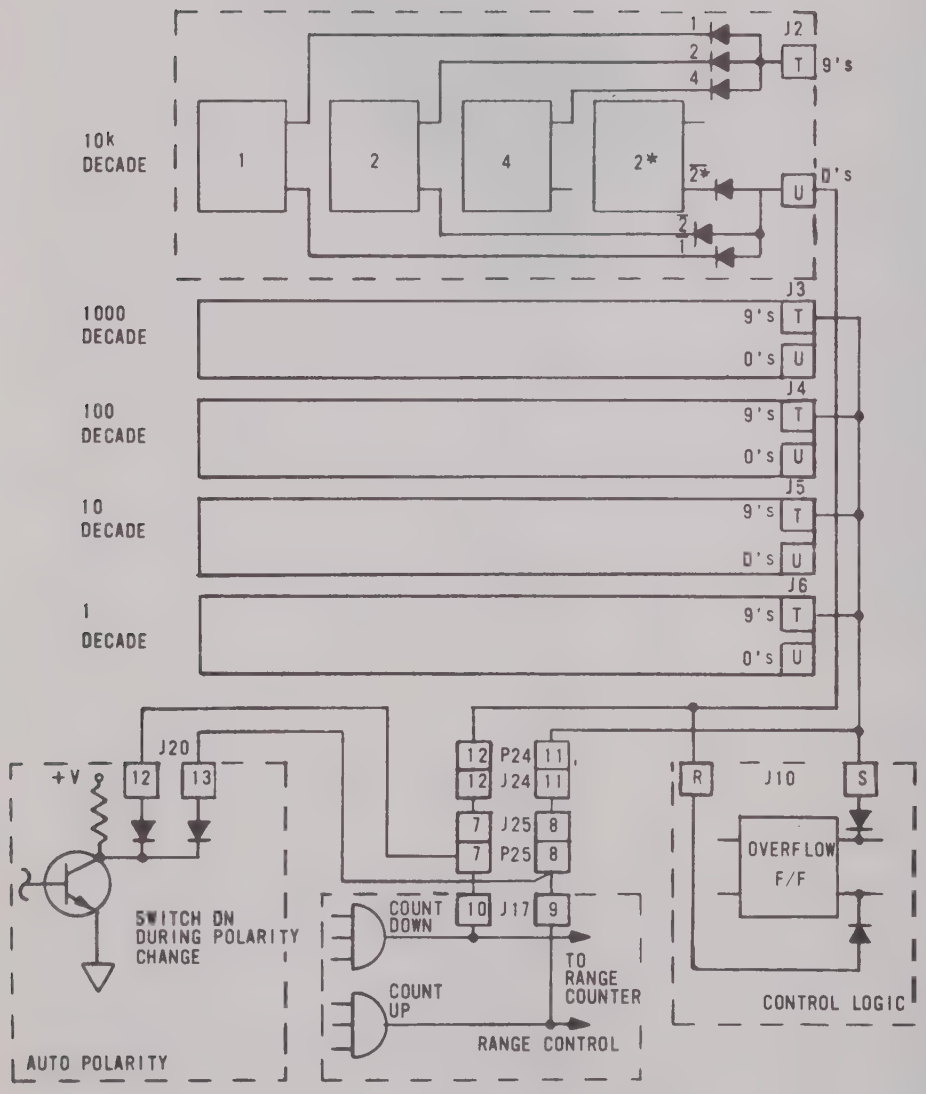


Figure 4.2. Range Counter Inhibit Lines

States			
R1	R2	R3	Range
0	0	0	1
1	0	0	10
0	1	0	100
1	1	0	1000
0	0	1	10,000

4.18. Since all ranges are not used for all functions, logic is present to prevent the counter from remaining on a prohibited range for a particular function. For example, with the Millivolt function selected, R2 is not allowed to reset and R3 is held "off" by the MV line applied to R2 and R3 through diodes CR37 and CR38. This allows only the 100 and 1000 ranges to be available with this function selected. Similarly, with the counter at 110 representing the 1000 range, a count-up pulse is inhibited unless the Kilohm function is selected—since that is the only function using the 10,000 range. The input line labeled Z is "false" when either AC, DC, DCF, or Ratio is selected. This line prevents the R3 flip-flop from setting—thereby skipping the 10,000 range.

4.19. Any fixed range, selected either manually or remotely, inhibits the automatic range function. This is done by logic gate "A" (Figure 4.10).

4.20 AUTO POLARITY (Schematic 430406)

4.21. The Auto Polarity board eliminates the need for polarity switching by maintaining, in conjunction with the Isolator output, a negative input to the Null Detector (in the digitizing and display section) regardless of the polarity of the input. The circuit consists of an inverting amplifier with polarity-dependent feedback paths, a differential amplifier, a polarity flip-flop, a one-shot circuit, and a relay driver.

4.22. The Isolator output is applied to the Auto Polarity board at pins D and 14. The signal is scaled to 10 volts full scale and of the same polarity as the input. When the input is negative, relay K1 is not energized and the signal (at pin 14) is routed directly to the Null Detector.

4.23. The Auto Polarity amplifier has a separate feedback path for each polarity. When the input signal is positive, the Auto Polarity amplifier output is negative. The output from the negative feedback path is routed to pin J of J20, through relay contacts on the AC Converter board and back to pin 1 of J20 and through a potentiometer, the + Polarity Gain adjustment, to the normally open contact of K1.

4.42. The negative voltage at the Auto Polarity output (at the junction of the two feedback diodes) and analog common form the input to a differential amplifier. The outputs of the differential amplifier enable the "dynamic and" gates at the polarity flip-flop input when at zero voltage. In this case (input signal positive), the gate at the reset input (2) of the flip-flop is enabled (the gate at 1 is approximately 10 volts).

4.25. Start-Stop is a signal from the digitizing and display section which is true (+14 volts) during the digitizing (measuring) time of the DVM. At the end of the measurement time, the line drops to zero and triggers the reset side (2) of the polarity flip-flop. The flip-flop outputs are now false (0 V) at 3 and true (+14 V) at 4.

4.26. The positive voltage at 4 turns on the relay driver (Q15) which provides a common to K1 and energizes that relay. The output to the Null Detector is now taken from the negative feedback path of the Auto Polarity amplifier.

4.27. The effect of the circuit can be summarized as follows: if the input signal is negative full scale (-10 volts), the output of the Isolator is also -10 volts. Relay K1 is not energized and the negative voltage from the Isolator is routed directly to the Null Detector. If the input signal is positive full scale (+10 V) the Isolator output is also +10 volts, the Auto Polarity Output (on negative feedback leg) is -10 volts. The Polarity flip-flop causes relay K1 to be energized and the negative voltage from the Auto Polarity amplifier is applied to the Null Detector. Therefore, the output to the Null Detector is always negative regardless of the polarity of the input.

4.28. A one-shot at the Polarity flip-flop output is triggered each time the Polarity flip-flop changes state. The one-shot "times out" in 10 msec at which time the DVM command (to Control Logic in digitizing and display section) is generated. The 10 msec allows relay K1 time to switch completely before the next reading is taken after a polarity change. During the 10 msec delay period, transistor Q17 is turned on clamping the 0's and 9's lines to digital common and thereby preventing the instrument from up- or down-ranging (in Auto Range) during a polarity change.

4.29 AC CONVERTER (Schematic 430437)

4.30. The AC Converter is an accessory board that may be plugged into the designated position in the instrument at any time. No special wiring is required; however, recalibration is required. The Converter consists of an AC-coupled, wideband, low-level amplifier with one permanent feedback path for the low range and shunt networks that are switched into the circuit by reed relays for the other two ranges. The unit is an operational amplifier, with resistor-capacitor pairs at the input and on the feedback loop. The full-scale output on all ranges is approximately 3 volts rms for a 10-volt rms input signal.

4.31. The output is applied to the Auto Polarity Amplifier which, in AC mode, serves as a full wave rectifier. Relay K3 is energized when AC is selected. It reroutes signals from the Isolator and Auto Polarity boards to obtain the proper circuit configuration for the measurement of AC volts.

4.32 OHMS CONVERTER (Schematic 430714)

4.33. The Ohms Converter is an operational amplifier used to generate a precise current through the unknown resistance. The range resistors, connected to the +20 volt internal reference voltage, determine the current source (+ current) to the summing junction at the input of the amplifier (+ sense). An equal amount of current is supplied to the summing junction, through the unknown resistor, from the output of the amplifier (- current). Because the reference current is taken from the internal reference of the DVM itself, the voltage output of the operational amplifier is a direct voltage equivalent of the unknown resistor value. The value of the range resistors is selected such that the output of the Ohms Converter is read by the DVM directly in kilohms.

4.34 MEASUREMENT OF DC VOLTS AND RATIOS

4.35. The circuit configuration used for the measurement of DC volts is shown in Figure 4.3. An identical arrangement is used when the instrument is in the ratio-measuring mode. The difference in these two types of measurements lies in the counterbalancing reference used in the Digitizing and Display section. DC volts are measured against a fixed internal reference; ratios are measured against an external reference.

4.36. As explained previously, the purpose of the signal conditioning section is to produce a negative 10-volt full scale signal (-10.9999, including overrange) at the input of the digitizing and display section. The negative voltage is applied across a precision resistor to produce a current that is nulled by an opposite current derived from the reference voltage.

4.37. The first step is to scale the incoming DC signal to 10 volts full scale. The precision scaling resistors in the Control and Attenuator circuit divide the input voltage by 10 if the signal is between $\pm$10.999 and $\pm$109.999 volts, and by 100 if the signal is between $\pm$109.999 and $\pm$1000.0 volts. The 10-volt full scale input is then filtered to remove superimposed noise and fed into the input of the Isolator.

4.38. The Isolator is, in this mode, a unity gain amplifier. Its output is therefore identical in polarity and amplitude with the scaled input. The voltage is directed to the 10K summing resistor in the Null Detector through the contacts of K1. When the Isolator output is negative, relay K1 is not energized and the negative voltage from the Isolator is applied directly to the summing resistor. When the Isolator output is positive, the Auto Polarity output is negative, the Polarity flip-flop is triggered, and the relay is energized. The negative Auto Polarity output is then applied to the summing resistor, through the Positive Gain Adjustment.

4.39. The current into the Null Detector, then, has two potential sources. If the input signal is negative, the Isolator output is negative and all of the required negative voltage is from the Isolator. On the other hand, if the input signal is positive, the Isolator output is positive, relay K1 is energized, and the negative voltage is taken from the Auto Polarity output.

4.40. The Auto Polarity amplifier derives its name from the fact that it allows the Null Detector to deal exclusively with negative currents from the signal conditioning section, without any delay for polarity switching. This is of particular importance when the signal is frequently passing through zero, as in the case of bridge balancing.

4.41. It is important to note that the Positive Polarity Gain adjustment is used to calibrate positive input voltages; however, the actual polarity of the voltage affected by this adjustment is always negative.

4.42 MEASUREMENT OF FAST DC VOLTS

4.43. When Fast DC measurements are being made, the configuration of the signal conditioning circuits is the same as for DC measurements except that the active filter is removed. Elimination of the filter allows the instrument to settle to within 0.01% of the final reading in 50 milliseconds, after a step-function change in input level.

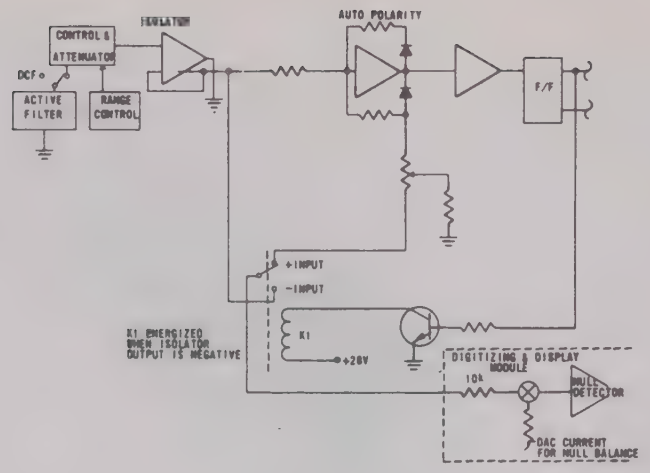


Figure 4.3. Block Diagram - DC and Ratio Modes

The filter slows the settling time down to 500 milliseconds. Other than this change at the input, the fast DC mode is identical to that of standard DC and ratio measurements.

4.44 MEASUREMENT OF MILLIVOLTS

4.45. The Signal Conditioning section "expands the scale" by switching the function of the Isolator circuit, changing it to a preamplifier. A 10-kilohm feedback loop is added to the amplifier. This, in conjunction with a resistance network to ground, switches the gain of the amplifier from unity to either 10 or 100. At a gain of 10, the instrument is operating at 1,000 millivolts full scale; at a gain of 100, full scale is 100 millivolts and the last digit resolution is 1 microvolt.

4.46. A passive filter is used at the input to attenuate superimposed noise. Otherwise the balance of the millivolt circuitry is identical to that used in measuring DC volts and ratios.

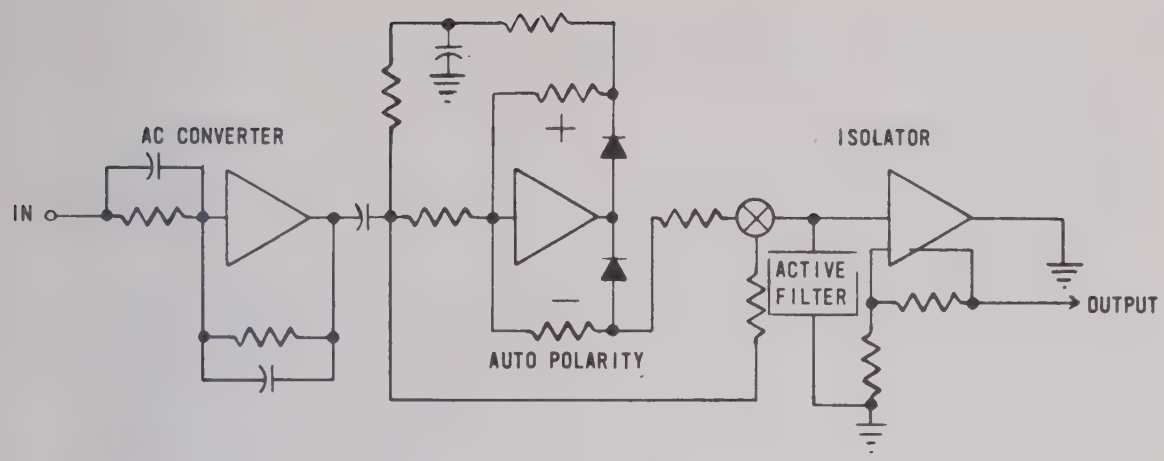
4.47 MEASUREMENT OF AC VOLTS

4.48. The measurement of AC volts involves the addition of the AC Converter amplifier and a major reorganization of the balance of the circuitry. Figure 4.4 illustrates this configuration.

4.49. The AC input signal is applied directly to the capacitor-coupled AC Converter amplifier. The principal purpose of this amplifier is to scale the input down so that the output of the stage is approximately 3 volts rms for a 10-volt rms, full-scale input signal. Input voltages in the 10-to-100 and 100-to-1,000 ranges are reduced by factors of 10 and 100, respectively.

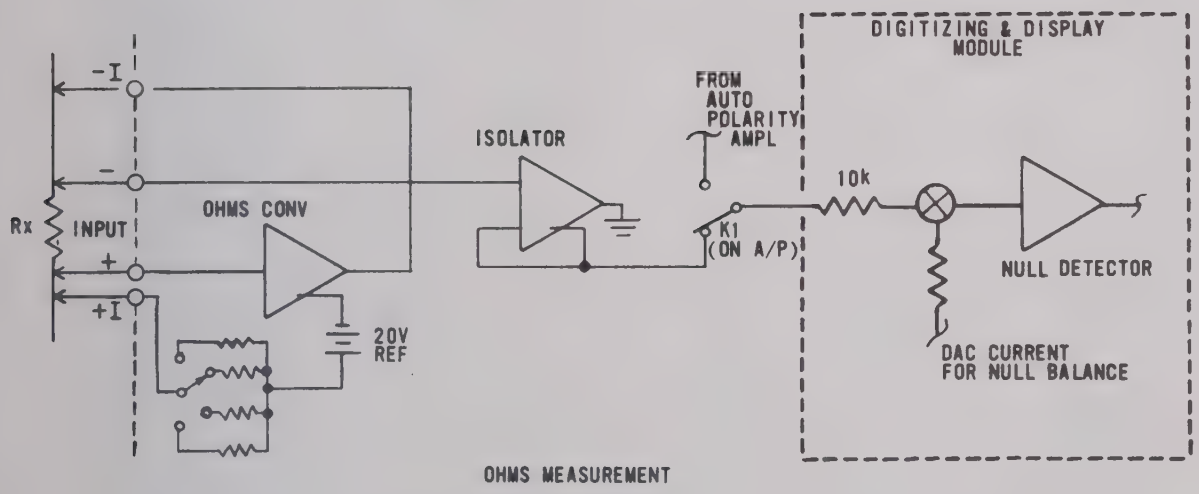
4.50. The scaled-down voltage is applied to the Auto Polarity amplifier, which rectifies it and produces a negative voltage that is approximately $1/\pi$ of the input. A 10-volt rms full-scale input to the instrument is now reduced by exactly 1/10, to -1 volt. The half-wave rectified output of the Auto Polarity circuit is "summed" with the AC Converter output to produce a one-volt full-wave signal (the "weight" of the Auto Polarity output is twice that of the AC Converter and 180° out of phase with it).

4.51. The output of the Auto Polarity amplifier is filtered by an active filter on the Control and Attenuator Assembly



AC MODE

Figure 4.4. Block Diagram - AC Mode



OHMS MEASUREMENT

Figure 4.5. Block Diagram - Ohm Mode

board and then applied to the Isolator, which has been set to a gain of 10 (using the feedback resistors and attenuators that established the 1,000-millivolt range in the mV mode). The amplified negative voltage is, at this point, a 10-volt full-scale analog of the rms value of the AC input. It is fed directly to the current-determining 10 Kohm resistor at the input to the Null Detector.

4.52 MEASUREMENT OF OHMS

4.53. The ohms measurement configuration (Figure 4.5) of the Signal Conditioning section is similar to that used in the measurement of DC with the DVM held in negative polarity. The Ohms Converter provides a series of precise currents (a different current for each range) which is passed through the unknown resistor. The resultant voltage drop is read by the DC measuring circuitry as a negative voltage and displayed as Kilohms.

4.54 DIGITIZING AND DISPLAY CIRCUITS

4.55. A simplified drawing of the Digitizing and Display section is shown in Figure 4.6. The input from the Signal Conditioning circuits is applied to a summing junction at the input to the Null Detector. Regardless of the polarity of the voltage being measured, the current from the Signal Conditioning section is always -1 ma full scale. This current is combined with a positive current from the DAC (Digital/Analog Converter) circuit.

4.56. DAC current supplied to the summing junction is the analog equivalent of the digital value represented by the state of the Decade flip-flops. When the summing junction is brought to null, the state of the flip-flops indicates the exact digital value of the input signal.

4.57. The digitizing process, or "conversion", begins when the Start/Stop flip-flop (on the Control Logic board) is set. Start/Stop is set by either of two conditions. The Display Rate circuit turns it on automatically every 250 milliseconds unless inhibited by a ground level at the Ground Hold input (READ/HOLD switch on HOLD) or a ground level at the Accessory Hold input. Start/Stop is also set by an External Command received through the remote programming input.

4.58. As Start/Stop is set, the negative-going edge of Start/Stop sets the Reset flip-flop. Reset is inverted to become S9 (Set 9) and applied to each of the Decades. Each Decade has four flip-flops representing X1 - X4 for that Decade. S9 sets the Decades to 99999. If, with the five Decades set to nines, DAC current is less than the input, the Overflow flip-flop is turned on by Overflow detecting logic on the Sequence Logic board. This adds additional DAC current representing a sixth digit (100K). If the resulting DAC current is still too low, the digitizing cycle is completed and the unit is made to uprange. If no higher range is available or permitted, the overrange condition (109999) is read out to indicate an excessive input.

4.59. Normally, however, the initial setting of 99999 results in a DAC current greater than the input current. This condition is detected by logic on the Sequence Logic board; the Sequence Counter is stepped to sequence state 1 (S1).

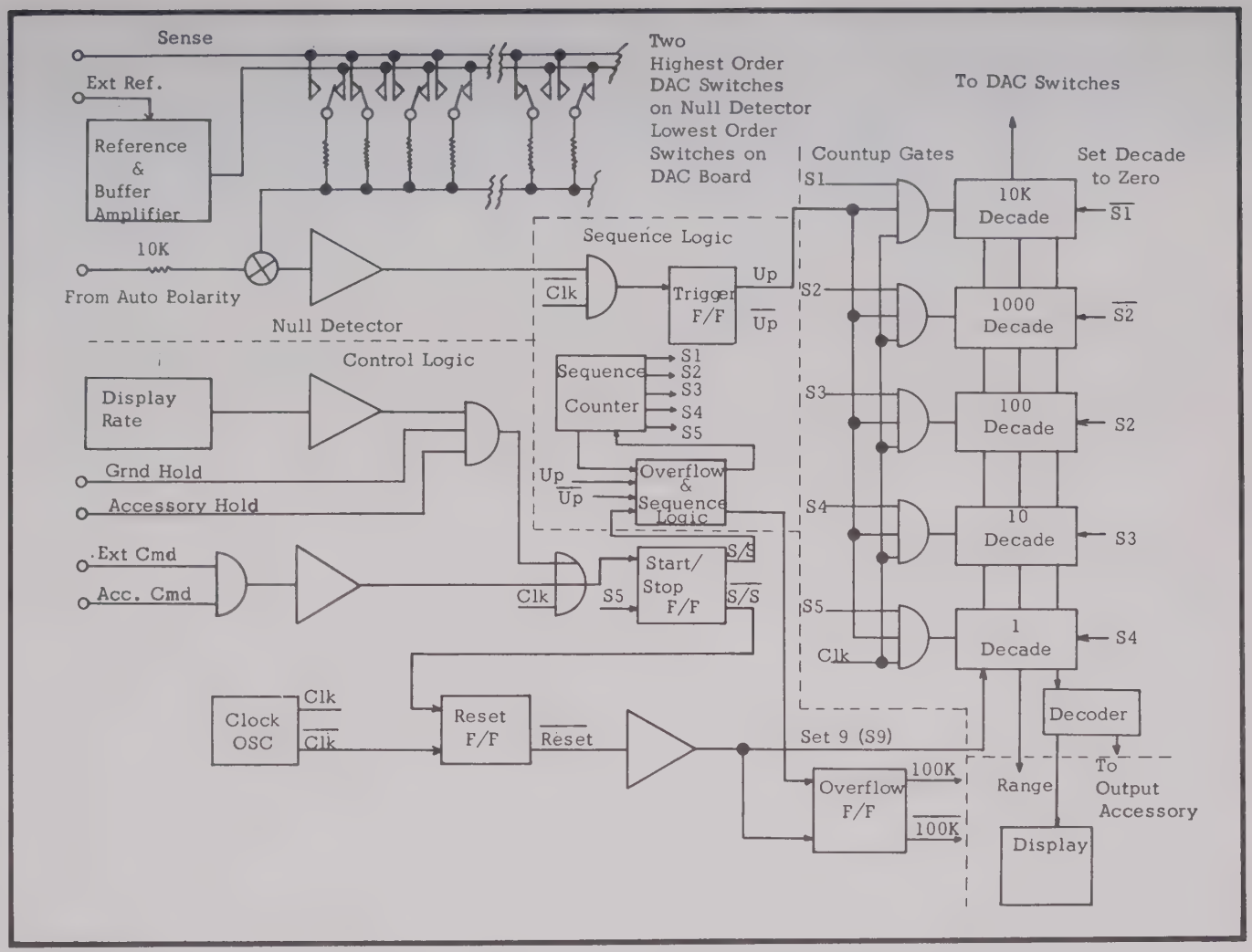


Figure 4.6. Block Diagram - Digitizing & Display Module

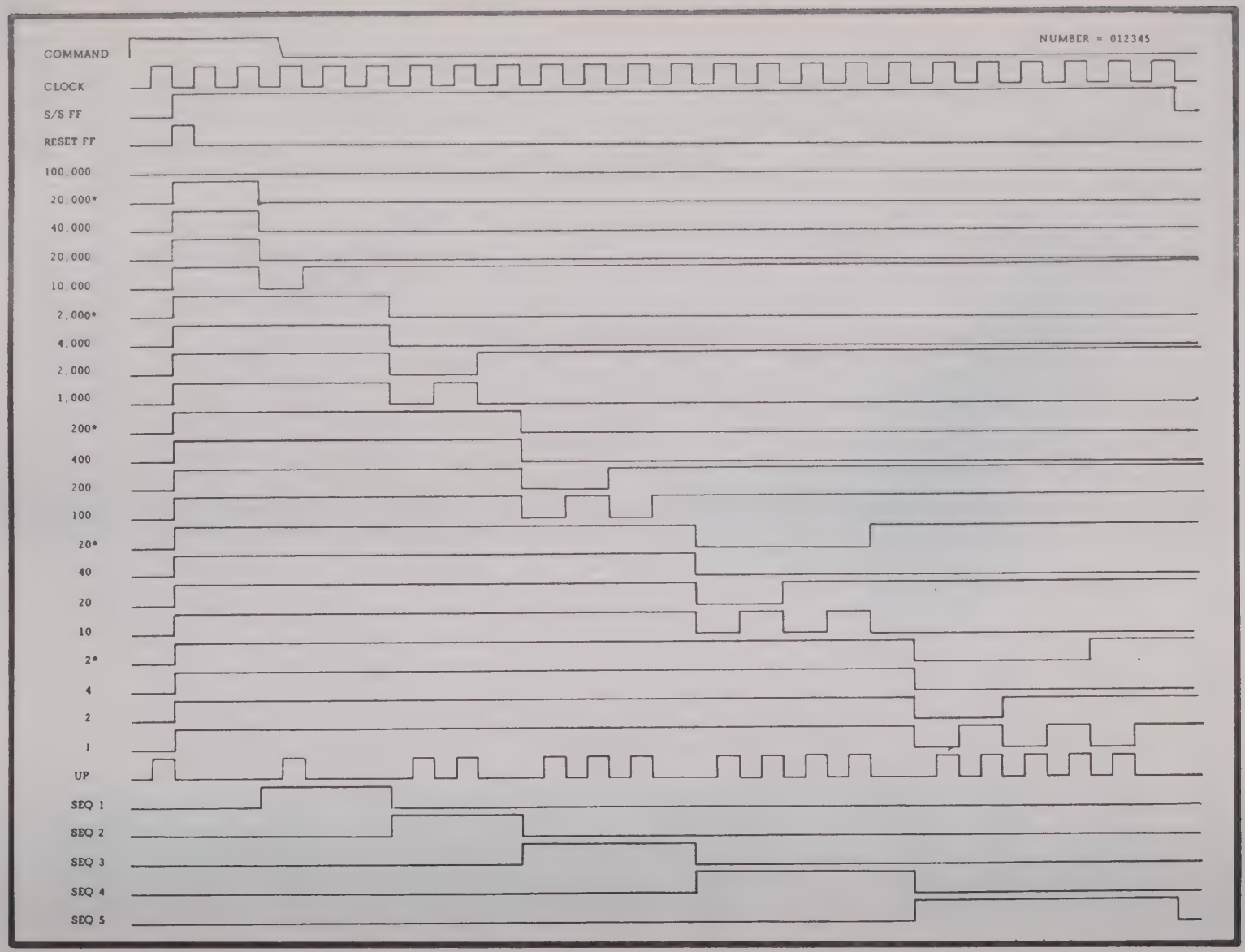


Figure 4.7. Model 5500 Timing (Without Overrange)

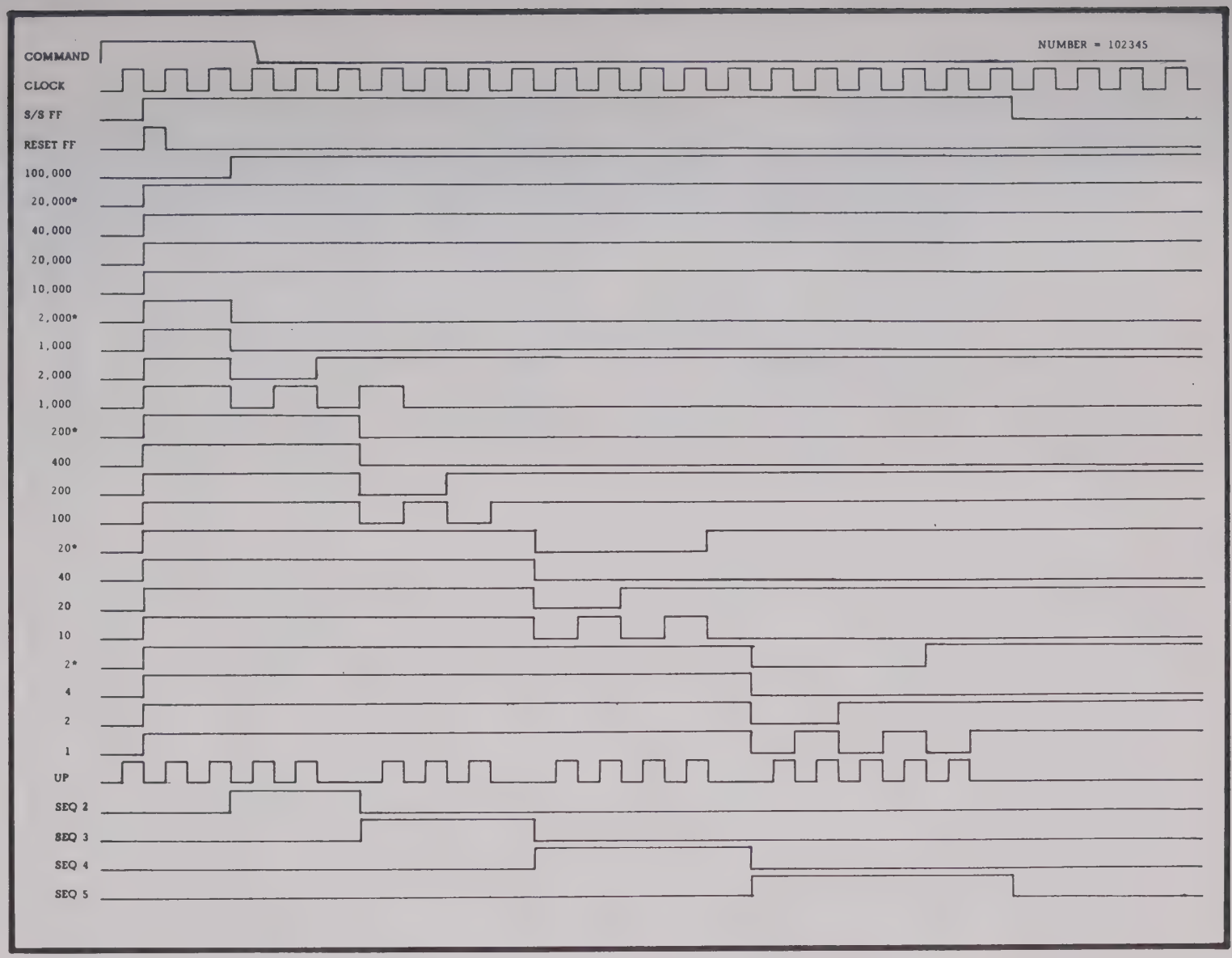


Figure 4.8. Model 5500 Timing (With Overrange)

4.60. In S1, the 10K Decade is "dropped" (each flip-flop "off"). The Decades are now set to 09999. If the resulting DAC current is less than the input current, the Null Detector causes the generation of UP at the Trigger flip-flop. The 10K Decade now counts up on each clock pulse until DAC current becomes equal to or greater than the input current. This condition is indicated by an UP from the Null Detector. The Sequencer then advances to S2 and the 1000 Decade is set to zero. If DAC current is less than the input current, the 1000 Decade is counted up in the same manner as the 10K Decade. This is repeated for each succeeding Decade. At the end of the S5, during which the 1 Decade is counted up, the Start/Stop flip-flop is turned off. At this time, the state of the Decades represents the digital value of the input signal and the conversion is complete. This operation is illustrated in the timing diagram of Figure 4.7. In the illustration the input is 012345. Figure 4.8 shows the timing with overrange.

4.61 NULL DETECTOR (Schematic 430379)

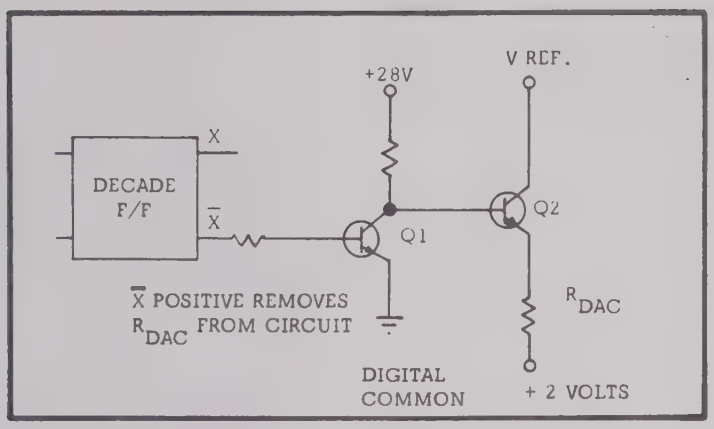
4.62. There are two main elements on the Null Detector circuit board; the two highest order Decade precision DAC (digital/analog converter) resistor matrices controlled by the state of the Decade flip-flops—and the Null Detector itself, an amplifier that detects and amplifies any difference in input current and DAC current.

4.63. A summing junction at the input to the Null Detector receives the negative input from the Signal Conditioning module and the DAC current. The two currents are balanced out by the DAC resistor network. The DAC current is developed from a precise 20-volt reference voltage from the Reference Buffer circuit board for absolute measurements or from an external reference when ratios are being measured.

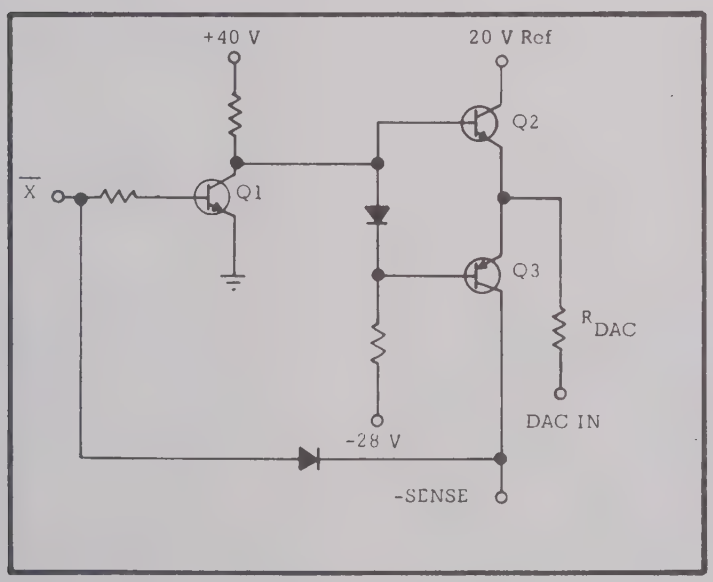
4.65. A typical DAC switch in the highest order decades is shown in Figure 4.9a. Q2 is normally on and R_{DAC} is in the circuit. When a positive voltage is applied to the base of Q1, Q1 is turned on and the resulting ground level at the base of Q2 back biases Q2 and R_{DAC} is out of the circuit. As shown in the figure, the switch is operated by the "not" side of the Decade flip-flop. When the flip-flop is "off" ("not" side true), the resistor is out of the circuit. Therefore, as a decade is counted up, resistance is added in parallel and DAC current increases at each step.

4.64. Two types of DAC switches are used: one for the lowest order decades (1, 10, 100, and 1000) and a different type for the highest order decase (10K). The 10,000 Decade switches and 1000 Decade, switches are located on the Null Detector board. The balance of the switches are on the DAC board (Schematic 430376).

4.66. A typical DAC switch for lowest order decades is shown in Figure 4.9b. Q2 is normally on, Q3 is normally off, and R_{DAC} is effectively connected to the reference supply. When a positive voltage is applied to the base of Q1, Q1 is turned on, biasing Q2 off and Q3 on; R_{DAC} is now effectively connected to negative sense. The junction voltage drops across Q3 are compensated for by R65 and CR11. As shown in the figure, the switch is operated by the "not" side of the decade flip-flop. When the flip-flop is "off" ("not" side true) the resistor is tied to the reference voltage.



(a) Highest Order Decade



(b) Lowest Order Decade

Figure 4.9. Typical DAC Circuits

4.67. The positive DAC current is applied to the summing junction at the Null Detector input. If the DAC current is greater than the negative current from the Signal Conditioning module, the resulting current is positive; if the Signal Conditioning input is greater, the resulting current is negative. The Null Detector is a high-gain amplifier that provides an output of sufficient amplitude to trigger the Trigger flip-flop only when the input (summing junction) is negative. The Trigger flip-flop is located on the Sequence Logic board; its output is the UP signal. UP and its complement, $\overline{UP}$, control generation of the sequence states which, in turn, control the counting operation of the Decades.

4.68 DECADES (Schematic 430390)

There are five Decade boards in the instrument, all identical. The Decade board nearest the front of the instrument controls the 10,000 digit; the second board the 1000 digit; the third, the 100 digit; the fourth, the 10 digit, and the fifth, the 1 digit.

4.69. At the beginning of a conversion, after the Start/Stop and Reset flip-flops (on Control Logic board) are set, the S9 line is made "true". This applies a positive voltage to the reset side of each flip-flop and represents "all to nine" condition. If the Null Detector indicates that 99999 is greater than the input signal, the Sequence Logic places the instrument in sequence state 1 (S1). S1 is applied to the C_o input of the 10K Decade. As S1 goes "true", the negative-going edge of S1 places a negative voltage on the reset input of the flip-flop, thereby resetting it to zero. The "true" output of the flip-flop and of each remaining flip-flop on the Decade resets the following flip-flop as it goes "false" (on negative-going edge). Each flip-flop on the 10K Decade is now "off" and the value represented by the four Decades has changed from 99999 to 09999.

4.70. S1 is applied to the input gate along with UP and a clock pulse. The Decade counter now counts up on each clock pulse. (Sequence state 1 (S1) enables count-up of the 10K Decade; S2, the 1K Decade; S3, the 100 Decade; S4, the 10 Decade; and S5, the 1 Decade). Counting continues until UP goes FALSE. At this time, the Sequence Logic places the instrument in sequence state 2 (S2) and the 100 Decade is reset by S2 applied to the C_o input. The count-up operation proceeds exactly as the 10K Decade, except that the input gate is now enabled by S2. The 100 Decade and 10 Decade counting operations begin on following UP signals. At the end of the 1 Decade counting operation (S5), the Sequence Logic counter and Start/Stop flip-flop are reset and no further sequence states are generated until the Start/Stop flip-flop is again set.

4.71. The "and" gates at the inputs to the 2 and 2* flip-flops adjust the count to eliminate "forbidden codes". Additional gates on the board receive various outputs from the flip-flops to detect the 0 and 9 states of the Decade for use of the range circuits in the Signal Conditioning module.

4.72. Also included on the Decade circuit board is a Decoder that interprets the state of the flip-flops and produces the drive voltage for the numerical display and the BCD data to the digital output accessory. There are five lines to the lamps, each representing a pair of numerals: 0 and 1, 2 and 3, 4 and 5, etc. Separate control lines determine whether the even

or odd numeral is to be lit. During the digitizing cycle, a blanking signal inhibits both the odd and even enable lines.

4.73 SEQUENCE LOGIC (Schematic 430393)

4.74. A counter on the Sequence Logic circuit board generates the five sequence states — or periods during which each Decade is reset to zero and then counted up. In addition, logic gates on the board determine when the sequence counter is turned on — and also detect the "overrange" condition where the input exceeds the five-digit capability of that range. Operation of the Sequence Logic is described in the following paragraph. In the first case, it is assumed that the input does not require the overrange function.

4.75. As S1 goes "true" $\overline{S1}$ goes "false". The negative-going edge of S1 resets the 10K Decade to zero (as explained under "Decades") and S1 enables the input gate to allow the Decade to start counting. The 10K Decade counts up until UP is received. UP resets the S1 flip-flop in the sequence counter. On the negative-going edge of S1, flip-flop S2 is set. The negative edge of S2 resets the 1K Decade to zero. S2 enables the input gate of the 1K Decade and it begins counting.

4.76. The Sequence counter advances to S3 on the next UP and the 100 Decade count operation is performed. S4 controls the counting of the 10 Decade, and S5 controls the counting of the 1 Decade. The negative-going edge of S5 resets the Start/Stop flip-flop.

4.77. The function of each sequence state can be summarized as follows:

$\overline{S1}$ resets 10K Decade to zero (on negative-going edge);

S1 enables 10K Decade count-up,

$\overline{S2}$ resets 1K Decade to zero (on negative-going edge);

S2 enables 1K Decade count-up, resets 100 Decade to zero (on negative-going edge);

S3 enables 100 Decade count-up, and resets 10 Decade to zero (on negative-going edge);

S4 enables 10 Decade count-up, and resets the 1 Decade;

S5 enables 1 Decade count-up and resets the Start/Stop flip-flop.

4.78. The overrange condition exists when, after the Decades are initially set to 99999, an UP is received. This indicates that the value represented by the state of the Decades is full-scale but still less than the input signal. This condition is detected by an "and" gate on the Sequence Logic board which receives the UP signal along with the clock, Start/Stop, and the "not" outputs of the sequence counter flip-flops. When UP enables this gate, a signal (Set 100K) is sent to the Control Logic board where it sets the overflow flip-flop. The overrange bit has a logical weight of 100,000. If the overrange bit is "true", the readout is 10XXXX. For reasons of linearity and accuracy, the analog weight of the resistor associated with this bit is 10,000. This requires that the 10K decade be set to 9 and results in a total weight of 9 + 1 or 10. The readout does not indicate 199999 but the true analog weight of 109999.

4.79. If, after the overrange bit is set, the new comparison at the Null Detector results in an $\overline{UP}$, this indicates that the input is some value between 99999 and 109999. The negative-going edge of 100K places the instrument into sequence state 3 and the conversion proceeds as described before, but with the 10K position remaining at 9 and the 1000 Decade the first Decade "dropped".

4.80. If, after the overflow bit is set, an UP is received — indicating that 109999 is still less than the input, a digitizing cycle is not performed and the unit is made to uprange (if instrument equipped for auto range). If no higher range is available, the overrange indication of 109999 is displayed (printed) to indicate an excessive input.

4.81 CONTROL LOGIC (Schematic 430685)

4.82. The conversion operation begins when the Start/Stop flip-flop is set. Start/Stop is set either automatically, by the Display Rate circuit, or by an external command.

4.83. The Display Rate circuit is an oscillator which delivers a pulse every 250 milliseconds when the READ/HOLD switch is in the READ position. The oscillator output is inverted and applied to an "and" gate. The gate is inhibited when the READ/HOLD switch is in HOLD — or by Accessory Hold if the line is at ground level. The Start/Stop flip-flop is set on the negative-going edge of Display Rate signal. Start/Stop is also set when an external command is received through the programming input.

4.84. As Start/Stop (S/S) is set, the negative-going edge of $\overline{S/S}$ sets the Reset flip-flop. RESET is applied through an inverter to the Decades as S9 (Set 9). It sets the Decades to 99999 and resets the Overflow flip-flop to zero. The Reset flip-flop is turned off by the next CLOCK.

4.85. The "true" output of the Start/Stop flip-flop is applied to an inverter. The inverter output is the blanking level which biases off the display lamps during the digitizing process. At the end of a conversion, Start/Stop is turned off by S5 (negative-going). This releases the blanking signal and, at that time, the state of the Decade is displayed.

4.86. The Overflow flip-flop is set by the Set 100K signal from the Sequence Logic board. Its output operates a corresponding DAC switch in the Null Detector representing a "1" digit in the 100K position. This feature allows an overrange voltage to be measured and displayed.

4.87 REFERENCE AND BUFFER AMPLIFIER (Schematic 430395)

4.88. The reference and Buffer Amplifier board serves two functions: it produces a precise 20-volt internal-reference output for absolute measurements, and it serves as a high input impedance, low-output impedance, buffer amplifier for external reference voltages used in ratio measurements. In ratio mode, this amplifier has a gain of 2. A relay on the board (K1) switches the circuit from an internal reference voltage supply to a buffer for the external reference voltage when energized by the RATIO command.

4.89. The internal reference circuit is based on the use of an aged Zener diode. The Internal Reference is a

divider network consisting of a fixed resistor, a potentiometer, and a Zener diode. The drive current for the Zener comes from the output of the Reference Buffer itself. Through careful selection of components and a balancing of the various resistances in the feedback network, an essentially zero temperature coefficient is achieved within the operating range of the instrument.

4.90 DISPLAY (Schematic 430389)

4.91. The Display board provides a mechanical assembly for the digital display tubes and carries the drive circuits for the neons that indicate decimal point, polarity, and range.

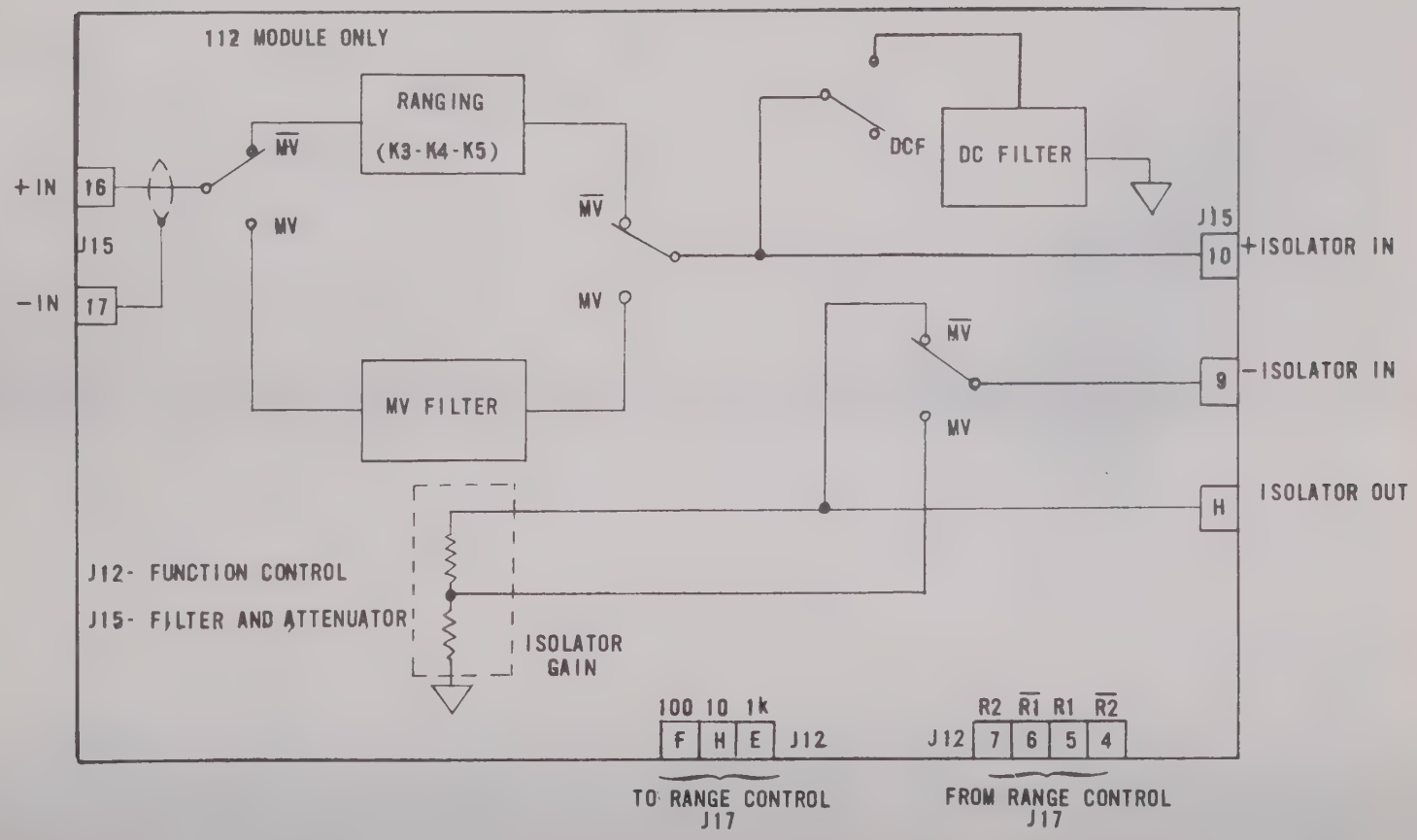


Figure 4.10a. Control & Attenuator Diagram - Model 112 Only

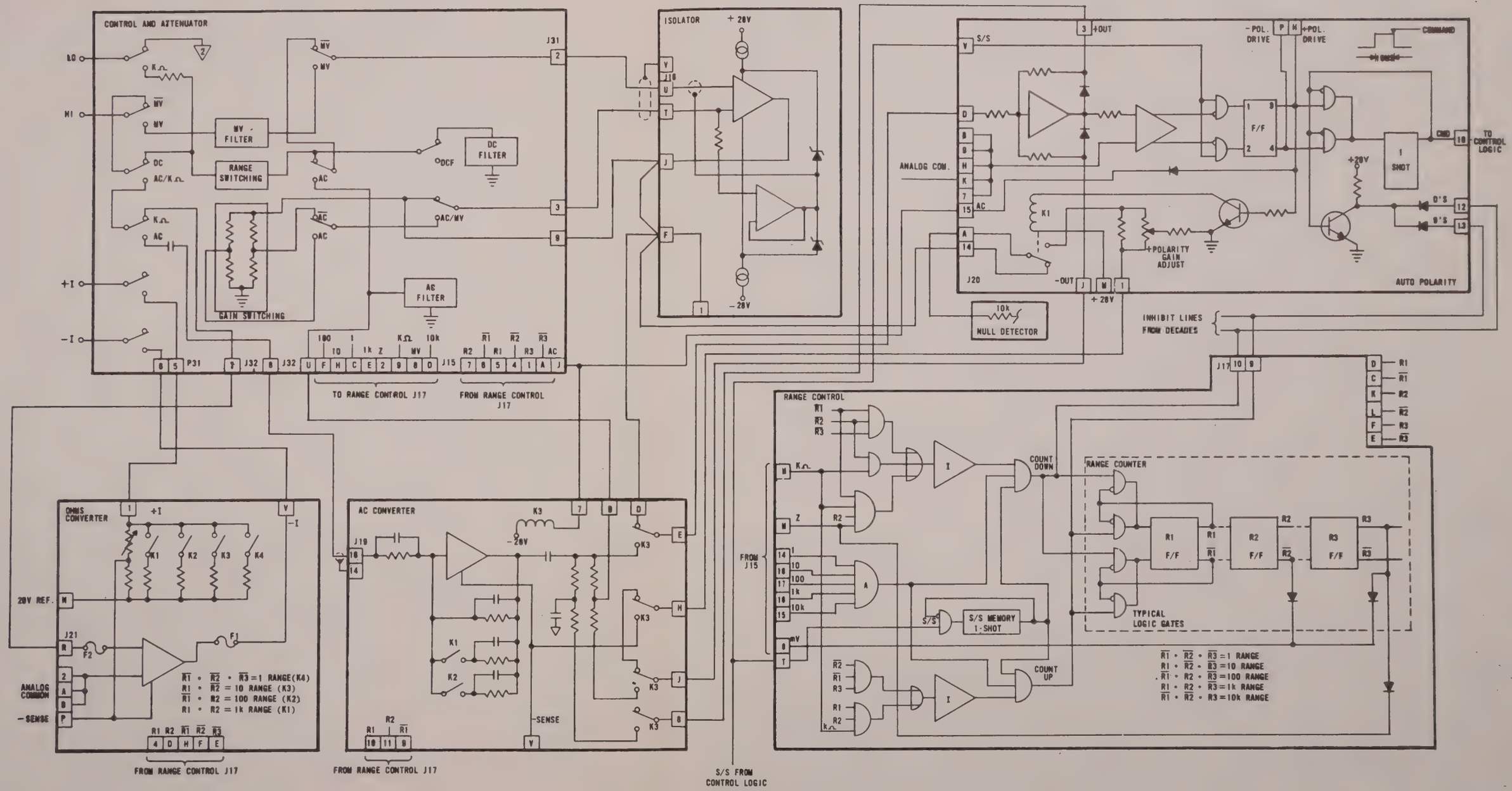


Figure 4.10. Functional Intraconnection - Signal Conditioning

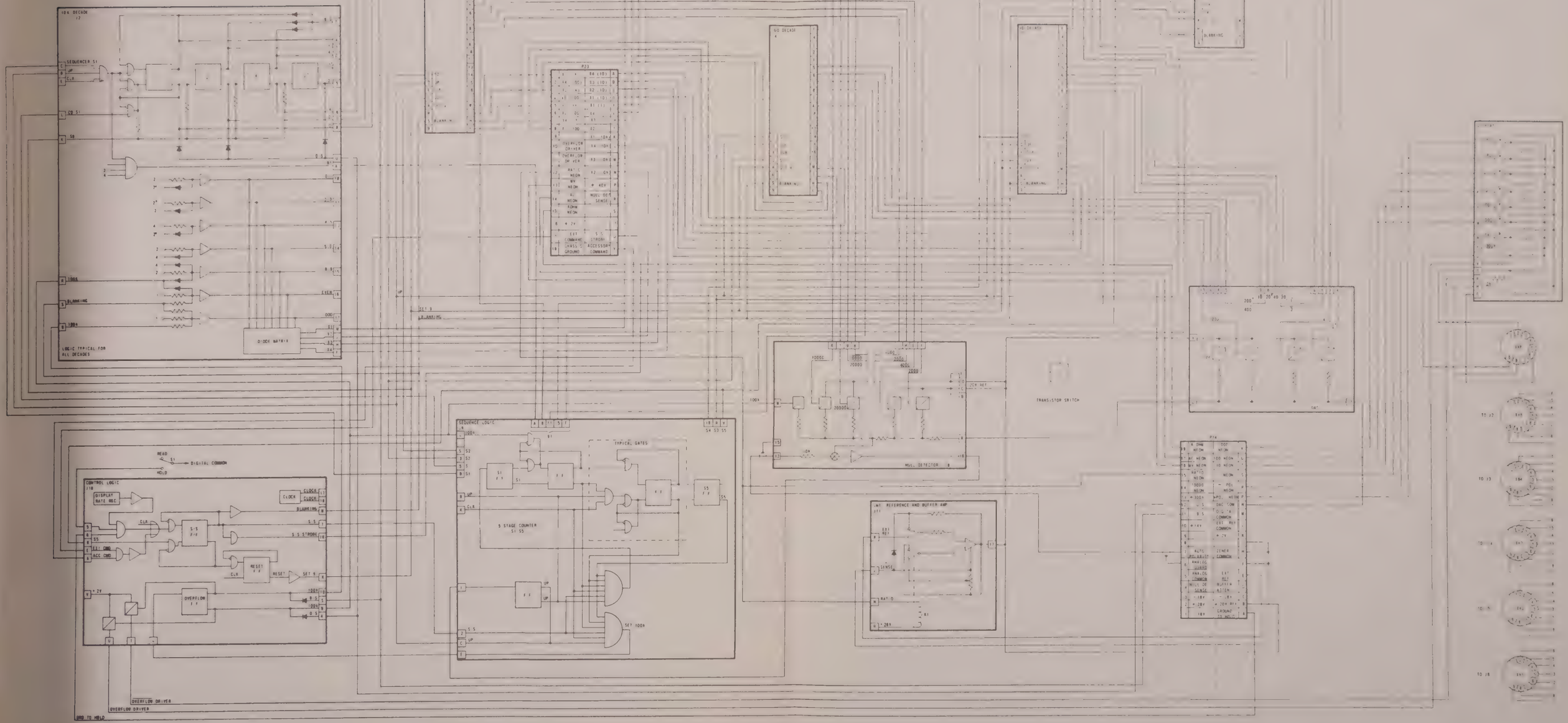


Figure 4.11. Functional Intraconnection - Digitizing and Display

SECTION 5

TROUBLESHOOTING & MAINTENANCE

5.1 INTRODUCTION

5.2. This section is to be used as a supplement to the schematics and assembly drawings of Section 6. Contained in this section are troubleshooting guides, power supply voltages, parts ordering information, and calibration procedures.

WARNING

Potentials over 300 volts are used in the instrument in the locations listed below:

Power supply

Display tubes

Display board

Decade boards

Range control board

5.3 MECHANICAL DISASSEMBLY

(a) Before opening the DVM, remove all power.

(b) To remove modules, turn knurled knobs on front panel counterclockwise; pull forward on the aluminum channel across the panel.

5.4 POWER SUPPLY

5.5. When checking for any major trouble in the DVM, make the following routine check of the power supply.

(a) Apply power to instrument

(b) Set READ/HOLD switch to READ. If readout is blank, refer to figure 5.1.

(c) The power supply voltages are most easily checked by placing the Null Detector board (J8) and one of the Decade boards (J2 through J6) on extenders and measuring the voltages at the pins indicated in table 5.1. If any of the voltages are low, indicating a short, isolate the cause by removing all boards. If the low voltage still exists, the problem is in the power supply itself (see schematic 430399) or a shorted strap on the main circuit board. If the voltage returns to normal, replace the boards, one at a time, until the board having the short is found.

5.6. If the power supply appears to be operating normally, refer to the Initial Checkout Procedures (2.14). In addition, perform the following check:

(a) Set RANGE to AUTO

(b) Set FUNCTION to DC

(c) Set READ/HOLD to READ.

(d) Set POWER to ON

Table 5.1. Power Supply Voltages

Pin	Schematic Ident.	Nominal	Ripple
J8-4	+40V	+52V	500mV
J8-T	+28V	+32V	500mV
J8-U	-28V	-32V	500mV
J8-N	+18V	+17V	5mV
J8-V	-18V	-17.5V	5mV
J2-V	+2V	+2.2V	20mV
J2-P*	+14V	+16V	225mV
J2-10*	+300V	+350V	500mV

*Referenced to digital common, J2-N; other voltages referenced to analog common, J8-P.

(e) Connect the signal input leads to a source of variable DC. Slowly increase the DC source voltage from zero to 10 volts. Check the DVM for problems covered in figures 5.4 and 5.5.

5.7 BOARD SUBSTITUTION

5.8. When spare boards are available, the most effective method of isolating a malfunctioning board is by substitution. Replace all boards in the DVM with spare boards. If the problem persists, the malfunction is narrowed down to that portion of the DVM still remaining. If the DVM is functioning normally with the spare boards, replace the spare boards, one at a time, with the original boards until the problem reappears. Repair or replace the malfunctioning board.

5.9 VISUAL INSPECTION

5.10. Check a malfunctioning board visually for burned components loose connections or any other abnormalities which could cause problems. Check also the printed circuit fingers which form the pins of the male connector at the bottom of the board for oil, dirt, etc. The fingers can be cleaned with a solvent or a common pencil eraser.

5.11 RESISTIVE CHECK

5.12. Component failures such as shorted capacitors, open resistors, and shorted or open semiconductors are easily located by checking the resistance of a component with a VOM.

5.13 DIODES. Resistance readings taken of diodes vary according to the range and type of VOM used. However, for forward biased resistance is usually in the order of a few hundred ohms and the front-to-back ratio is in the order of 1000 or more.

5.14 ZENERS. Zener diodes may be checked in the same way as diodes and will show whether the diode junction of the zener is open, shorted or normal (zeners tend to appear leaky). However, only by applying power to the device can the voltage regulating properties of the zener be checked.

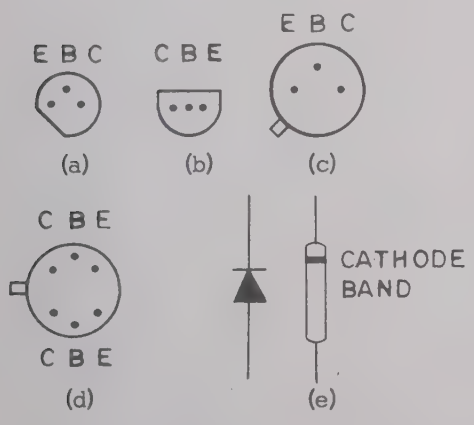
5.15 TRANSISTORS. With respect to their junctions, transistors are two diodes connected together with the base lead connected in the middle (see table 5.2). These two "diodes" are checked for their forward and back resistance. In addition, a check is made across the emitter and collector for any leakage.

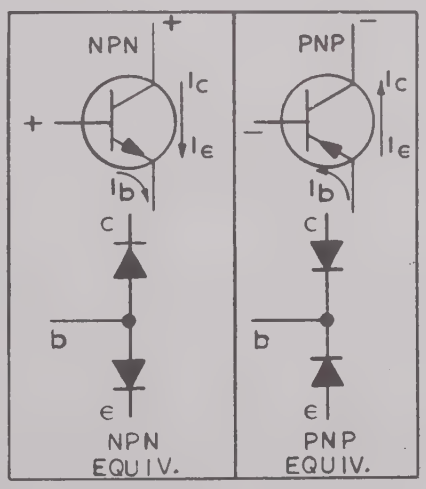
5.16 BIASING

5.17. When resistive checks of the components fail to discern the cause of the trouble, normal circuit tracing techniques are used. The most useful of these involves the checking of operating levels or "biasing" of the active components.

Table 5.2. Component Characteristics

Identity	Configuration (See Below)	Type	Usage	Notes
009	c	PNP	Medium power	Case Common to Collector
012	b	PNP	Analog	Epoxy
014	c	NPN	Medium power	Case Common to Collector
015	d	Dual NPN	Low level 1st stage	Case insulated
016	d	Dual NPN	Low level 1st stage	Case insulated
2N3565	a	NPN	High gain analog	Epoxy
2N3646	a	NPN	High speed digital	Epoxy
007	e	Diode	Low leakage	Glass
018	e	Diode	Logic	Glass
SD4	e	Diode	Power	Epoxy
1N916	e	Diode	Low leakage	Glass
1N9586	e	Zener	7.5v	Glass
1N961b	e	Zener	10v	Glass
1N967b	e	Zener	18v	Glass or Epoxy
M24A25	e	Zener	2.4v	Glass





5.18 DIGITAL. Digital circuitry performs all of its functions using only two logic states: +14 volts and digital common. These two levels are normally referred to as "true" and "false" and may be in the form of pulses or levels. Diodes are used as gates and pass or reject data according to whether the diodes are forward or reverse biased. Transistors are used as inverters. A logic true at the input of an inverter results in a logic false at the output and a false input results in a true output. Flip-flops can be analyzed as two inverters with inputs and outputs interconnected. In the biasing of logic transistors the collector is either at digital common (actually about 0.2 volts above) or at a positive voltage determined by the load on the output, the collector resistor, and the supply voltage (normally +14 volts). For the collector to be false, the transistor is turned on by a sufficient amount of current entering the base (approximately 0.8 mA). The voltage from emitter to base is between 0.6 and 0.7 volts on all logic transistors.

5.19 ANALOG. In analog circuitry, the transistor collector is biased at some potential less than the supply voltage but more than the base voltage. Varying the base-emitter current results in a corresponding change in collector current and collector voltage such that increasing the base-emitter current causes an increase in collector current. The increased collector current results in an increase in the I-R drop across the collector load and the collector voltage becomes nearer the base voltage. Less base-emitter current results in a collector current nearer the supply voltage. Check transistors for transistor action by shorting together the base and emitter leads and observe that the collector returns to the supply voltage.

5.20 TROUBLESHOOTING CHARTS

5.21. Unless otherwise noted, the following troubleshooting charts (figures 5-1 through 5-5) are valid only when the instrument is programmed as stated below.

(a) Set RANGE to 10

(b) Set FUNCTION to DC

(c) Set MODE to READ

(d) Set POWER to ON

(e) Connect input leads together.

Table 5.3. Decade Fault Isolation

MALFUNCTIONING DECADE	DISPLAY READOUT	CONTROLLING SEQUENCE F/F
10K	099999	1
1K	009999	2
100	000999	3
10	000009	4
1	*00000	5

*May have double number

The Display Readout column represents the position of the DAC when the sequence count is interrupted by: (1) a malfunctioning decade board, or (2) a malfunctioning sequence F/F. Remove the decade whose corresponding display readout most nearly matches the DVM display.

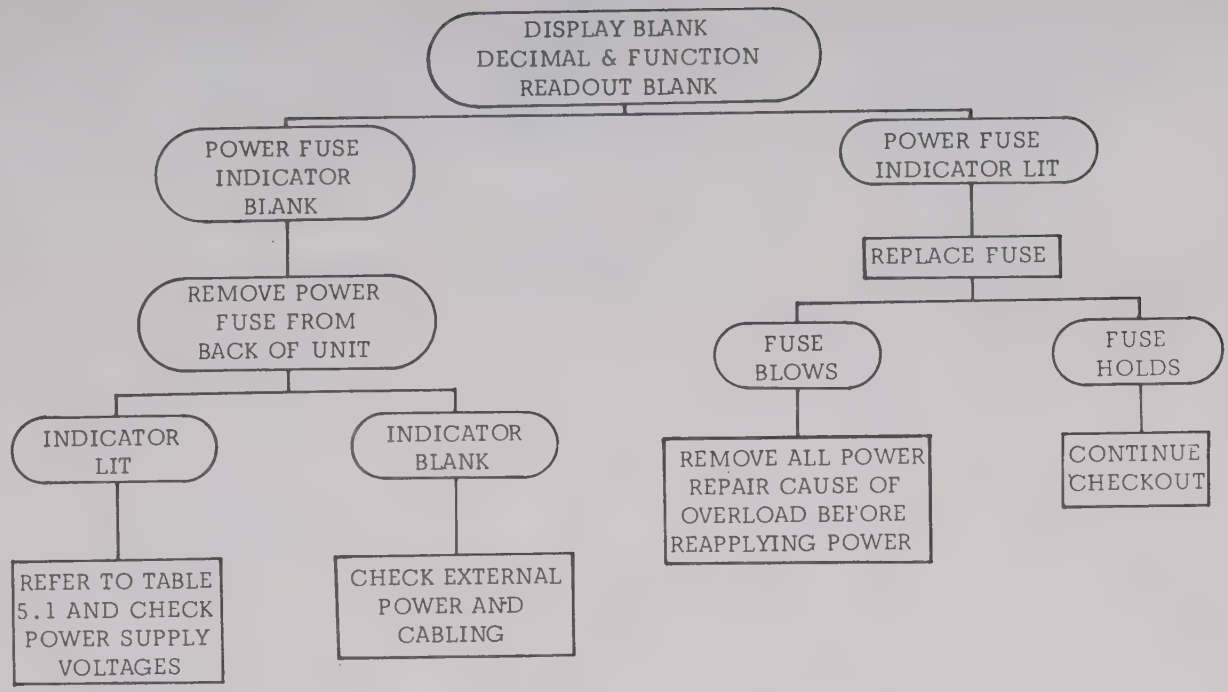


Figure 5.1. Troubleshooting - Display, Decimal & Function Readout Blank

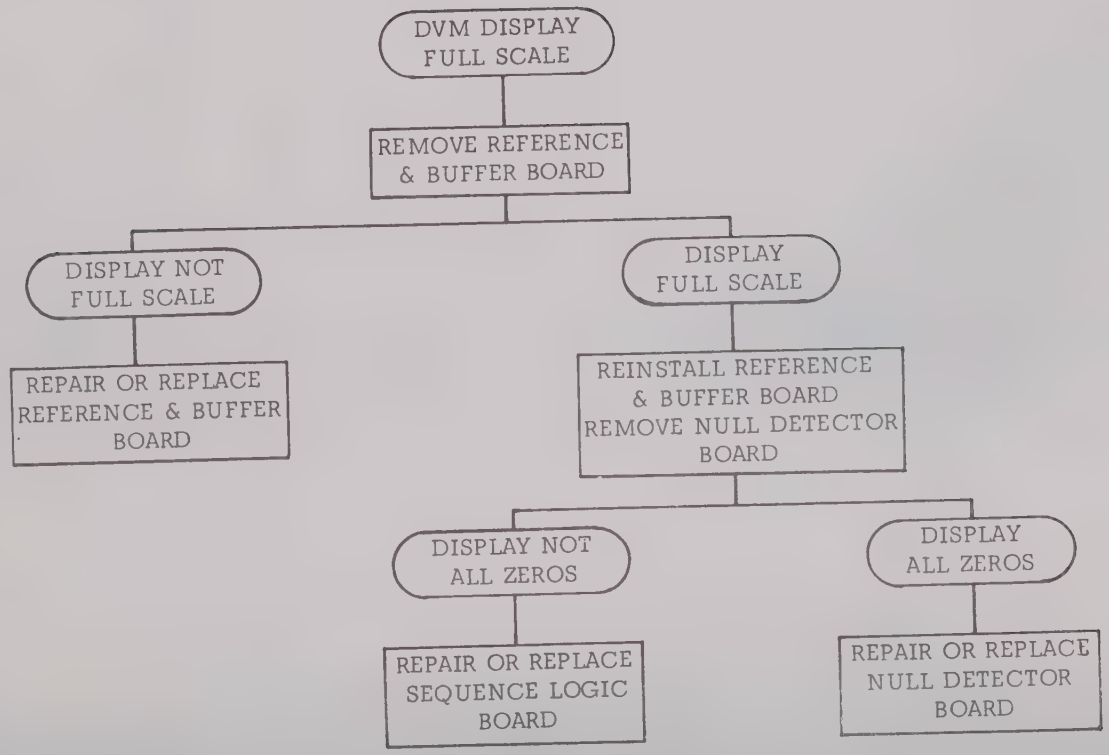

DVM DISPLAY FULL SCALE
REMOVE REFERENCE & BUFFER BOARD
DISPLAY NOT FULL SCALE
REPAIR OR REPLACE REFERENCE & BUFFER BOARD
DISPLAY FULL SCALE
REINSTALL REFERENCE & BUFFER BOARD REMOVE NULL DETECTOR BOARD
DISPLAY NOT ALL ZEROS
REPAIR OR REPLACE SEQUENCE LOGIC BOARD
DISPLAY ALL ZEROS
REPAIR OR REPLACE NULL DETECTOR BOARD

Figure 5.2. Troubleshooting - Display Full Scale

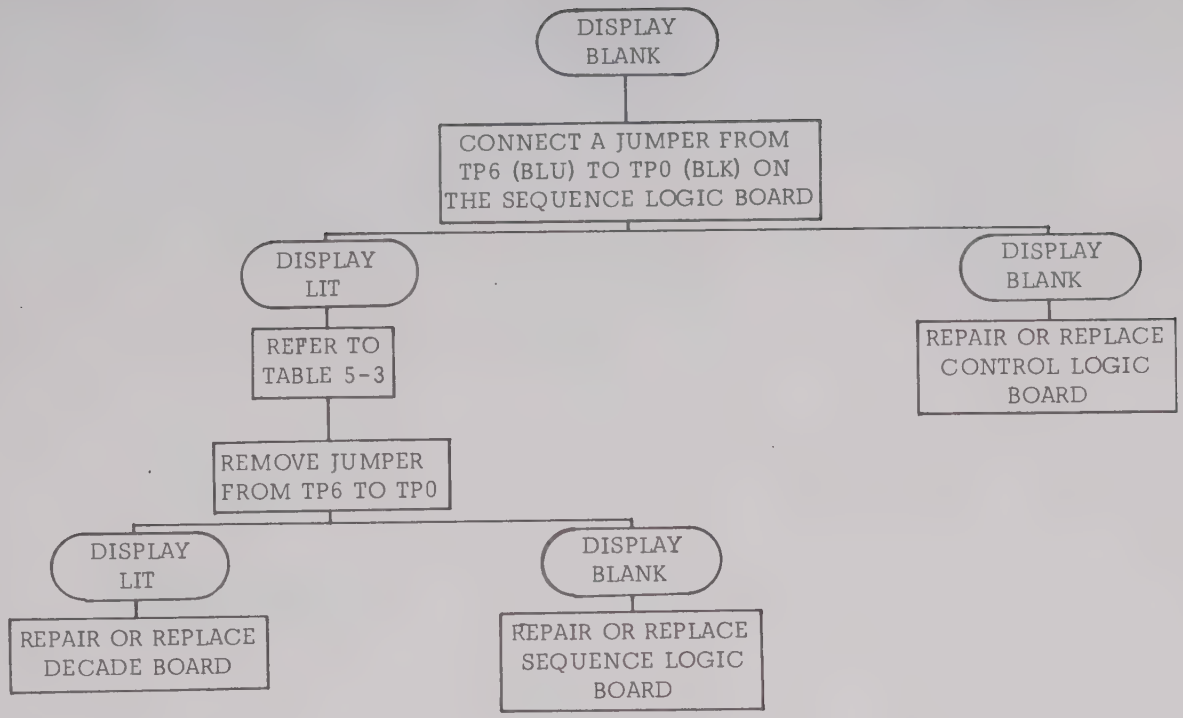
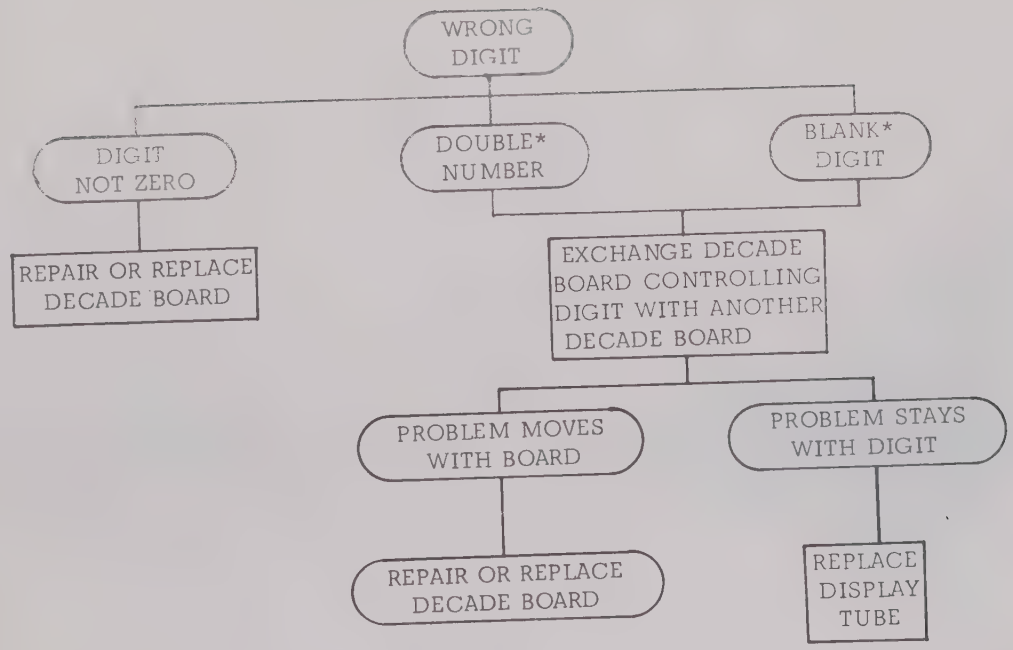
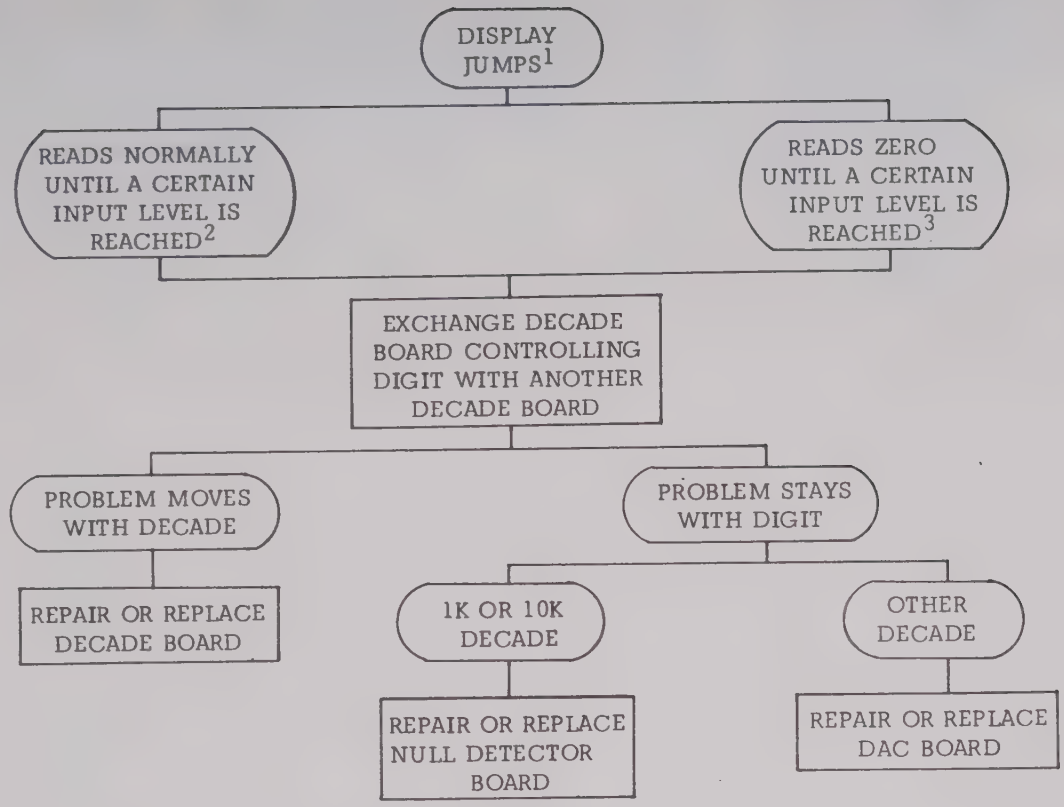

DISPLAY BLANK
CONNECT A JUMPER FROM TP6 (BLU) TO TP0 (BLK) ON THE SEQUENCE LOGIC BOARD
DISPLAY LIT
REFER TO TABLE 5-3
REMOVE JUMPER FROM TP6 TO TP0
DISPLAY LIT
REPAIR OR REPLACE DECADE BOARD
DISPLAY BLANK
REPAIR OR REPLACE SEQUENCE LOGIC BOARD
DISPLAY BLANK
REPAIR OR REPLACE CONTROL LOGIC BOARD

Figure 5.3. Troubleshooting - Display Blank



*On certain input voltages

Figure 5.4. Troubleshooting - Wrong Digit


DISPLAY JUMPS[1]
READS NORMALLY UNTIL A CERTAIN INPUT LEVEL IS REACHED[2]
READS ZERO UNTIL A CERTAIN INPUT LEVEL IS REACHED[3]
EXCHANGE DECADE BOARD CONTROLLING DIGIT WITH ANOTHER DECADE BOARD
PROBLEM MOVES WITH DECADE
PROBLEM STAYS WITH DIGIT
REPAIR OR REPLACE DECADE BOARD
1K OR 10K DECADE
OTHER DECADE
REPAIR OR REPLACE NULL DETECTOR BOARD
REPAIR OR REPLACE DAC BOARD

1. With input increased from zero to full scale
2. DAC switch open or held off
3. DAC switch shorted or held on

Figure 5.5. Troubleshooting - Display Jumps

5.22 ORDERING PARTS

5.23. Standard parts can be obtained through Dana Laboratories Incorporated, its local representatives or through other vendors. Consult parts list in Section 6 for value, tolerance and rating. When ordering parts include the following information:

(a) Instrument type

(b) Description of part including reference designator, Dana part number, and component type

(c) Name of printed circuit board (if applicable)

5.24 PARTS REPLACEMENT

5.25. The following material is recommended for parts replacement:

(a) 60/40 rosin core solder

(b) wire braid - thin

(c) rosin flux

(d) rosin solvent - such as denatured alcohol

(e) diagonal wire cutters

(f) long-nose pliers

5.26. The following steps should be taken to replace components on printed circuit boards.

(a) Dip one end of the wire braid in flux and place it on the solder joint on the back of the printed circuit board. Use care to keep the braid on the etch circuit to prevent burning of the board.

(b) Place the tip of the iron firmly against the braid until the solder is observed on the braid.

(c) Remove the iron and the braid from the board. Lift the lead away from the etch pad with the diagonal wire cutters and straighten the lead with a pair of long-nose pliers.

(d) Repeat the above steps for each lead on the component.

(e) When the lead is perpendicular to the board, pull the lead through the hole in the board with a pair of pliers.

(f) Remove the flux and burned moisture resistant coating from the board with a flux solvent.

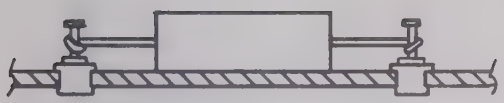
(g) Bend the leads of the replacement component to line up with the holes on the circuit board. Holes filled with solder can be opened by heating pad with the soldering iron and using a toothpick or other soft pointed object to clear the hole.

(h) Insert the leads and seat the new component firmly against the board. Bend leads if required and cut as shown in figure 5.6.

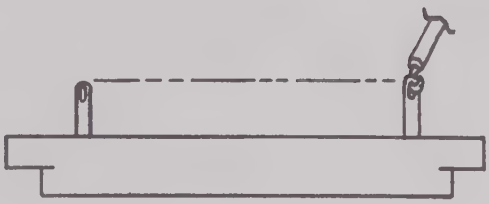
(i) Apply enough solder to cover wire and strap. Both wire and strap should be discernible. Apply just enough heat to allow the solder to flow freely.

(j) Clean new solder connection whti a flux solvent.

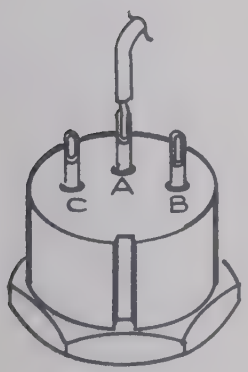
(a) Soldered, flush mounted potentiometer



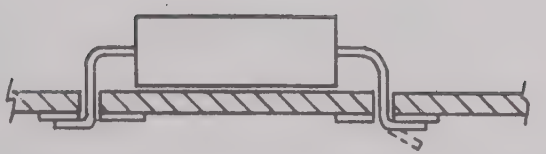
(b) Pre-soldering lead preparation, terminal mount



(c) Pre-soldering wire preparation, flat pin connector



(d) Pre-soldering wire preparation, tabular pin connector



(e) Pre-soldering lead preparation, printed circuit

Figure 5.6. Component Installation

5.27 INTRODUCTION

5.28 This Calibration procedure covers the calibration of both the Model 112 and Model 130 accessories. Calibration points are shown in figures 5.7 and 5.8.

5.29 Access to calibration points is from the top, requiring the removal of the top cover of the DVM. Unless otherwise noted, calibration steps refer to both the 112 and 130 modules.

5.30 REQUIRED CALIBRATION EQUIPMENT

5.31 The equipment required by the user for the calibration of the Model 5500 is listed below.

(a) Service card extender DP/N-400839 (supplied by Dana Laboratories, Inc.).

(b) Precision null-type microvoltmeter (Fluke 845AR or equivalent).

(c) Precision DC power supply (COHU Model 326 or equivalent).

(d) Precision voltage divider (E.S.I. Dekavider RV622A or equivalent).

(e) Precision AC source.

(f) Resistance standard.

5.32 CALIBRATION PROCEDURE

5.33 For all zeroing operations, the low side of the microvoltmeter is referenced to Analog Output Common. For each adjustment, the controls are to be left as set up for previous adjustment unless otherwise indicated.

5.34 ISOLATOR ZERO

(a) Set FUNCTION control switch to MV, RANGE control switch to AUTO, and READ/HOLD control switch to READ.

(b) Short +SIGNAL INPUT and -SIGNAL INPUT together.

(c) Connect microvoltmeter lead to Analog Output terminals. Adjust MV ZERO control on front panel for 0 + 100 microvolts out.

(d) Set FUNCTION control switch to DC FAST.

(e) Adjust current zero potentiometer R7 on the isolator board for 0 $\pm$ 15 microvolts.

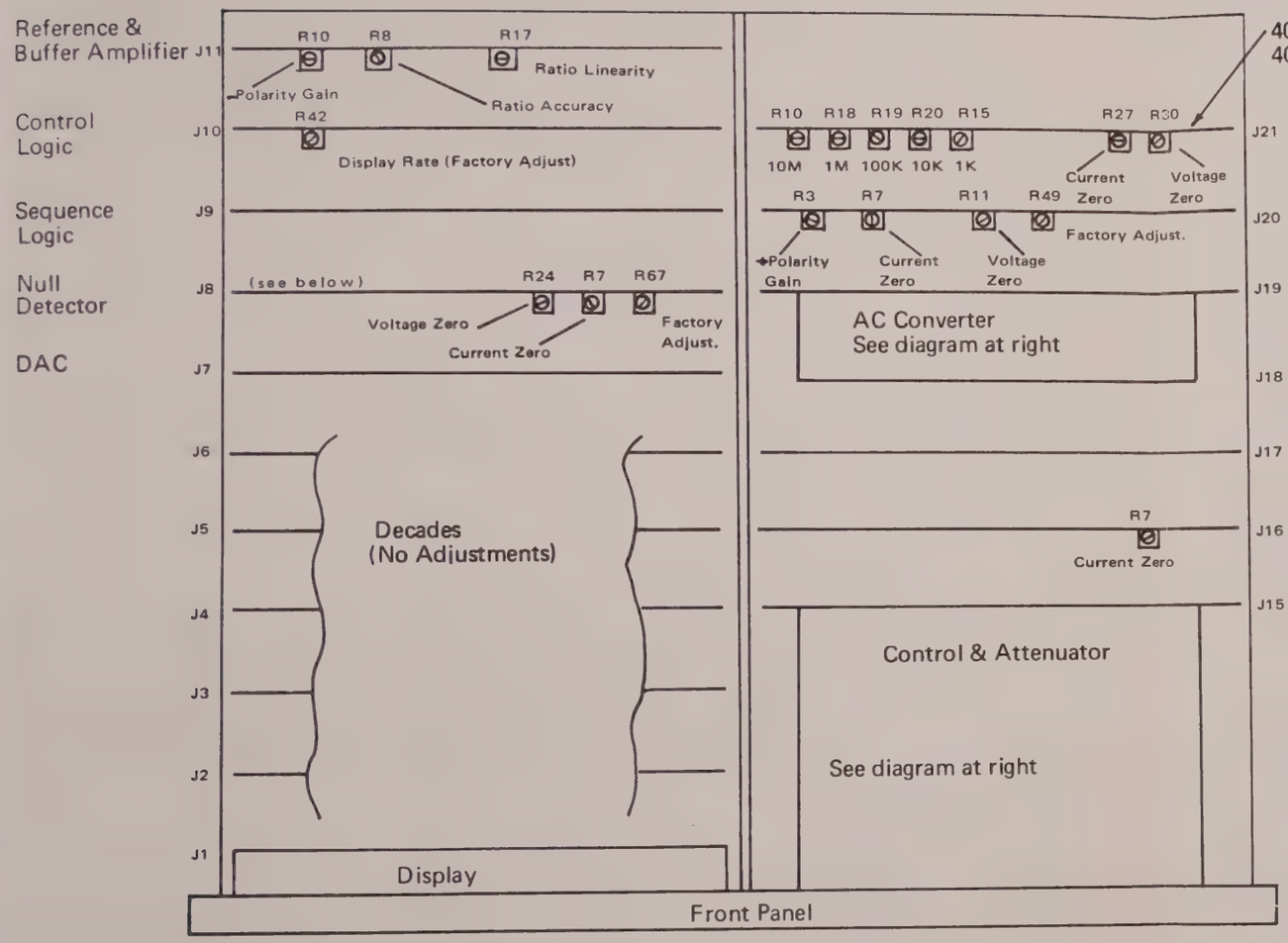
(f) Repeat steps (a), (c), (d), and (e) to ensure accuracy.

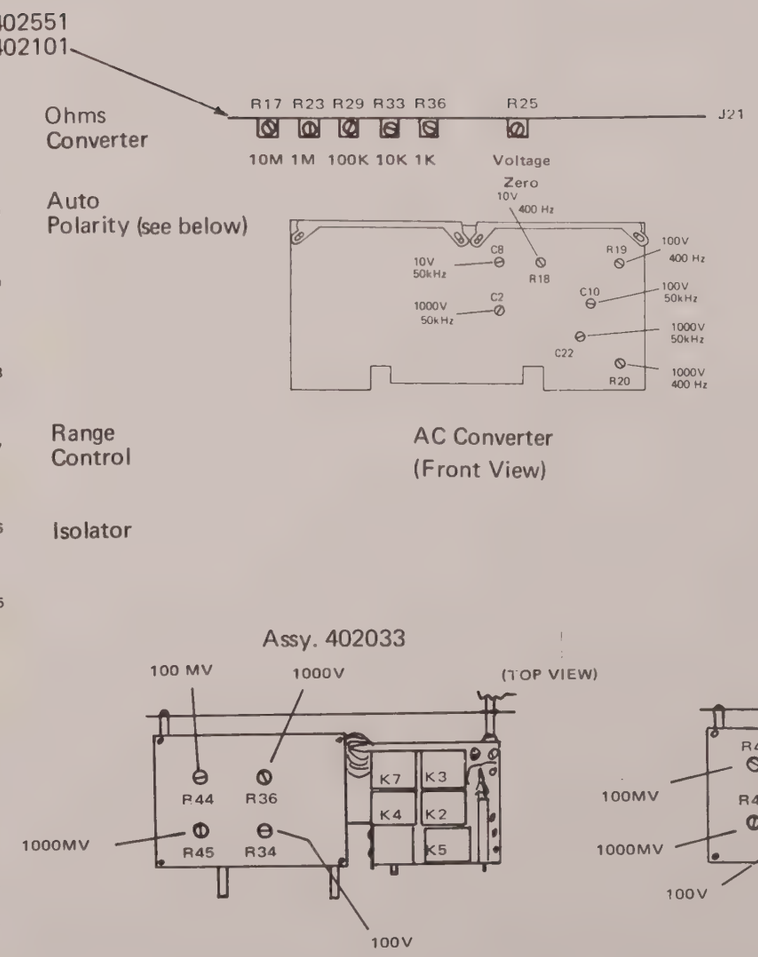
(g) Remove microvoltmeter connections from Analog Output terminals.

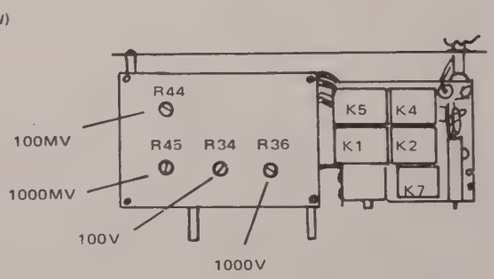
5.35 NULL DETECTOR ZERO

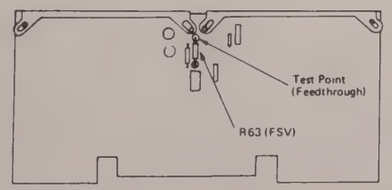
(a) Force readout to -000000 (remove null detector board, adjust R11 on the Auto Polarity board for - polarity, place DVM in HOLD and Reinsert the null detector board).

(b) Connect the microvoltmeter lead to the feedthrough supporting the top of resistor R63 on the Null Detector board (see figure 5.7). R63 is a factory-selected value and may be a jumper wire.

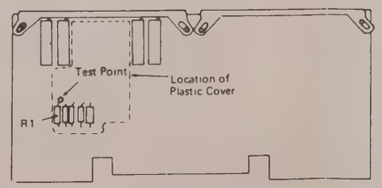








Null Detector Test Point



Auto Polarity Test Point

Figure 5.7. Adjustment Locations

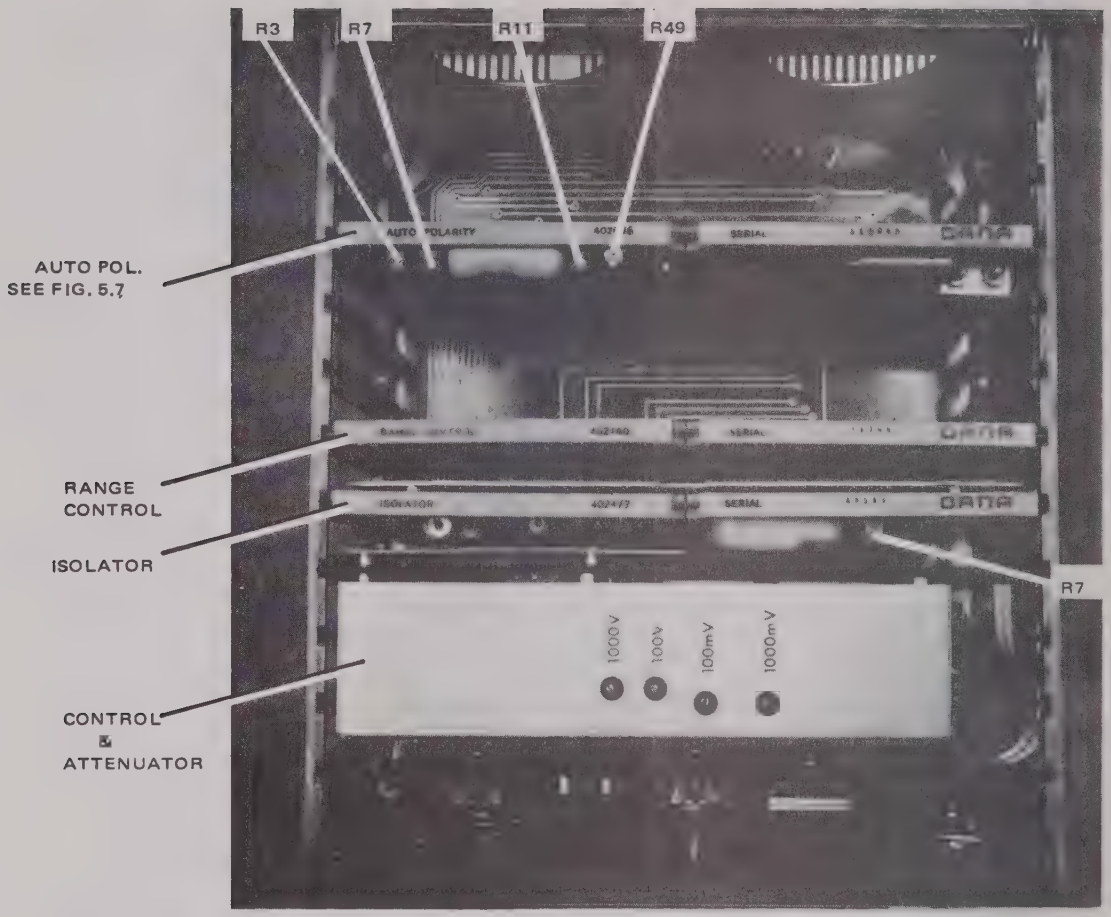


Figure 5-8. Module 112 Calibration Points

Table 5.4. Simplified Zeroing Procedure

The following procedure can be used as a field zeroing procedure or when the zero is just slightly out of adjustment.

(a) Set FUNCTION to DC, RANGE to AUTO, and MODE switch to READ.

(b) Short input leads together.

(c) Connect microvoltmeter to the Analog Output terminals.

(d) Adjust MV ZERO potentiometer on front panel for a microvoltmeter reading of zero $\pm$10 uvolts.

(e) Apply an input signal of -1.0 mV. Adjust the null detector current zero potentiometer (R7) until the readout bounces between -00.0009 and -00.0010.

(f) Apply an input signal of +1.0 mV. Adjust the auto-polarity current zero potentiometer (R7) until the readout bounces between +00.0009 and +00.0010.

(g) If unit has an AC position on the function switch, set switch to AC. Check to see that the readout is less than 00.0010 with the input shorted. If not, adjust the auto-polarity current zero (R7) to bring the readout between 00.0010 and 00.0005.

(h) Check steps (b) through (g) to see that readings are within tolerance given. If a zero reading with shorted input cannot be obtained after completing the above procedure, it will be necessary to use the detailed zeroing procedure (5.33 through 5.36).

(c) Adjust the current zero potentiometer R7 for a reading of 0 ± 10 microvolts on the microvoltmeter.

(d) Remove the microvoltmeter lead from the Null Detector board.

5.36 AUTO POLARITY ZERO

(a) Connect the microvoltmeter, through a 10K resistor, to the test point described in the following note.

NOTE

On earlier Auto Polarity assemblies, the test point is a standoff to which, the upper end of R1 is connected (see figure 5.7) and removal of the plastic cover is required for access. The Auto Polarity board must be placed on an extender. On later production runs, the standoff is replaced by a feedthrough making the test point accessible on the back side of the board. On these assemblies, neither the board nor the cover need be removed. It may be necessary to remove the Ohms Converter board for access.

(b) Adjust the 5K voltage zero potentiometer R11 for 0 ± 10 microvolts output on the microvoltmeter.

(c) Remove the microvoltmeter lead from the test point.

5.37 DVM POLARITY ADJUSTMENT

(a) Set READ/HOLD to READ.

(b) Remove the short from the + and - Input Signal lines and connect to a known -1 MV ± 10 μv.

(c) Adjust the Null Detector voltage zero potentiometer (R24) until Readout Display reads between 9 and 10 digits in equal proportions.

(d) Switch DC Source to Positive polarity and adjust input to +1 millivolt ± 10 μv.

(e) Adjust the Auto Polarity current zero (R7) until the Readout Display reads between 9 and 10 digits in equal proportions.

(f) Repeat steps (b) through (e) to ensure accuracy.

5.38 RATIO LINEARITY

(a) With RANGE remaining on AUTO and READ/HOLD on READ, set FUNCTION switch to 10X RATIO.

(b) Connect the DVM as shown in figure 5.9 with +10 volts power supply voltage and the voltage divider set to 0.999900.

(c) Note the Readout display at +10 volts and reduce the dc supply to +2 volts.

(d) Adjust Ratio Linearity potentiometer R17 on the Reference and Buffer Amplifier board until the DVM readout display at 2 volts and at 10 volts are the same (within 5 digits). Adjustment must be made at 2 volts.

5.39 PLUS AND MINUS POLARITY GAINS

(a) Set FUNCTION switch to FAST DC.

(b) Connect the Signal Input leads to the Power Supply and select -9.99900 volts.

(c) Adjust Minus Polarity Gain potentiometer R10 on the Reference and Buffer Amplifier for a DVM display of -09.9990 volts.

(d) Reverse the Polarity of the input voltage and adjust the plus polarity gain potentiometer R3 on the Auto Polarity for a DVM display of +09.9990 volts.

(e) Repeat steps (b), (c), and (d) to ensure accuracy.

5.40 RATIO ACCURACY

(a) Set FUNCTION control switch to 10X RATIO.

(b) Connect the DVM as shown in figure 5.9 with the power supply set at a precise +10 volts. Set the Voltage Divider to 0.999900.

(c) Adjust the Ratio gain potentiometer R8 on the Reference & Buffer Board accuracy for a DVM Readout display of +09.9990.

5.41 DC RANGE CALIBRATION

(a) Set FUNCTION control switch to FAST DC and the RANGE control switch to 100.

(b) Connect the Signal Input leads to a known -100 volt source (0.0005%).

(c) Adjust the Control board 100 volt range potentiometer R34 for a Display readout of -100.000.

(d) Set the Range Control switch to 1000 and connect the DVM to a known -1000 volt source.

(e) Adjust the 1000 volt range potentiometer R36 for a Display readout of -1000.00.

5.42 MILLIVOLT RANGE CALIBRATION

(a) Set FUNCTION switch to MV and the RANGE control switch to 100.

(b) Short input leads together and adjust the MV ZERO potentiometer for a DVM display of all zeros.

(c) Connect the Signal Input leads to a known 100 MV source.

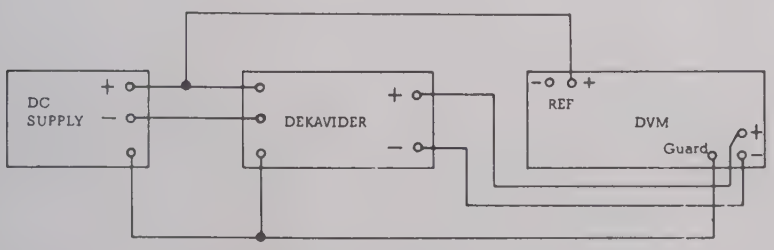


Figure 5.9. Ratio Test Set-Up

(d) Adjust Control board 100 MV range potentiometer R44 for a Display of 100.000.

(e) Set RANGE control switch to 1000 and connect DVM to known source of 1000 MV.

(f) Adjust 1000 MV range potentiometer R45 for a Display of 1000.00.

5.43 AC RANGE CALIBRATION (130)

(a) Place AC Converter board on extender and set the 1000 volt capacitor (5) to the middle of its span (slot vertical).

(b) Set FUNCTION control switch to AC and Range Control switch to AUTO.

(c) Connect the Signal Input to the following series of AC voltages and frequencies, adjusting the indicated adjustment until the instrument displays the known voltage value:

C2 and C8 on opposite side of board

Volts, RMS	Frequency	Adjustment (Figure 5.7)
125.00	400 Hz	R20
125.00	50 kHz	C2
9.0000	400 Hz	R18
9.0000	50 kHz	C8 *
125.00	50 kHz	C22
90.000	400 Hz	R19
90.000	50 kHz	C10

*This adjustment must be checked at 9.0000 V and 50 kHz with AC Converter board taken off of extender and placed in normal position in DVM. Adjustment (made while on extender) should be made for amount of difference observed when taken off of extender and placed in regular connector. This must be repeated until 9.0000 V is obtained when not on extender.

When all adjustments are completed, remove AC Converter from extender and replace in DVM.

(d) Check frequency response at 50 Hz, 5 kHz, 10 kHz, 50 kHz, and 100 kHz on all ranges. Use test voltages of 9, 90, and 125 volts.

5.44 KILOHM RANGE CALIBRATION (130 Ohms Converter Assembly 402101 only)

(a) Put Ohms Converter on extender. Set RANGE to AUTO; READ/HOLD to READ. Set FUNCTION control to KOHMS and connect the microvoltmeter (with a 10K resistor in each lead) across the two bases of input transistor Q11. Set RANGE control to 10,000.

(b) Short input of DVM and adjust voltage zero potentiometer R25 on Ohms Converter for a microvoltmeter reading of 0 $\pm$ 30 microvolts. Remove microvoltmeter leads from Q11. Remove Ohms Converter from extender and replace in DVM.

(c) Connect the DVM input leads for ohms measurement (Section 2) to a 10 Megohm standard and adjust the Ohms Converter 10 Megohm range potentiometer for a DVM display equal to the value of the standard.

(d) Repeat with standard resistors near full scale of the remaining four ranges; adjusting the appropriate controls on the ohms board for a DVM display for each standard value.

5.45 KILOHM RANGE CALIBRATION (130 Ohms Converter Assembly 402551)

(a) Set RANGE to AUTO; READ/HOLD to READ. Set FUNCTION switch to KILOHMS.

(b) Short the following terminals together; +SIGNAL, -SIGNAL, and -OHMS CURRENT SOURCE.

(c) Adjust Voltage Zero potentiometer for zero display on DVM.

(d) Remove short between ±SIGNAL and the two other leads and insert 1 Megohm resistor between +SIGNAL and the two other leads.

(e) Adjust Current Zero potentiometer for zero display on DVM.

(f) Connect the DVM input leads, connected for ohms measurement (Section 2), to a 10 Megohm standard and adjust the Ohms Converter 10 Megohm range potentiometer for a DVM display equal to the value of the standard.

(g) Repeat with standard resistors near full scale of the remaining four ranges, adjusting the appropriate controls on the ohms board for a DVM display for each standard value. Begin at highest range and work toward lowest.

SECTION 6

DRAWINGS AND PARTS LISTS

DRAWINGS

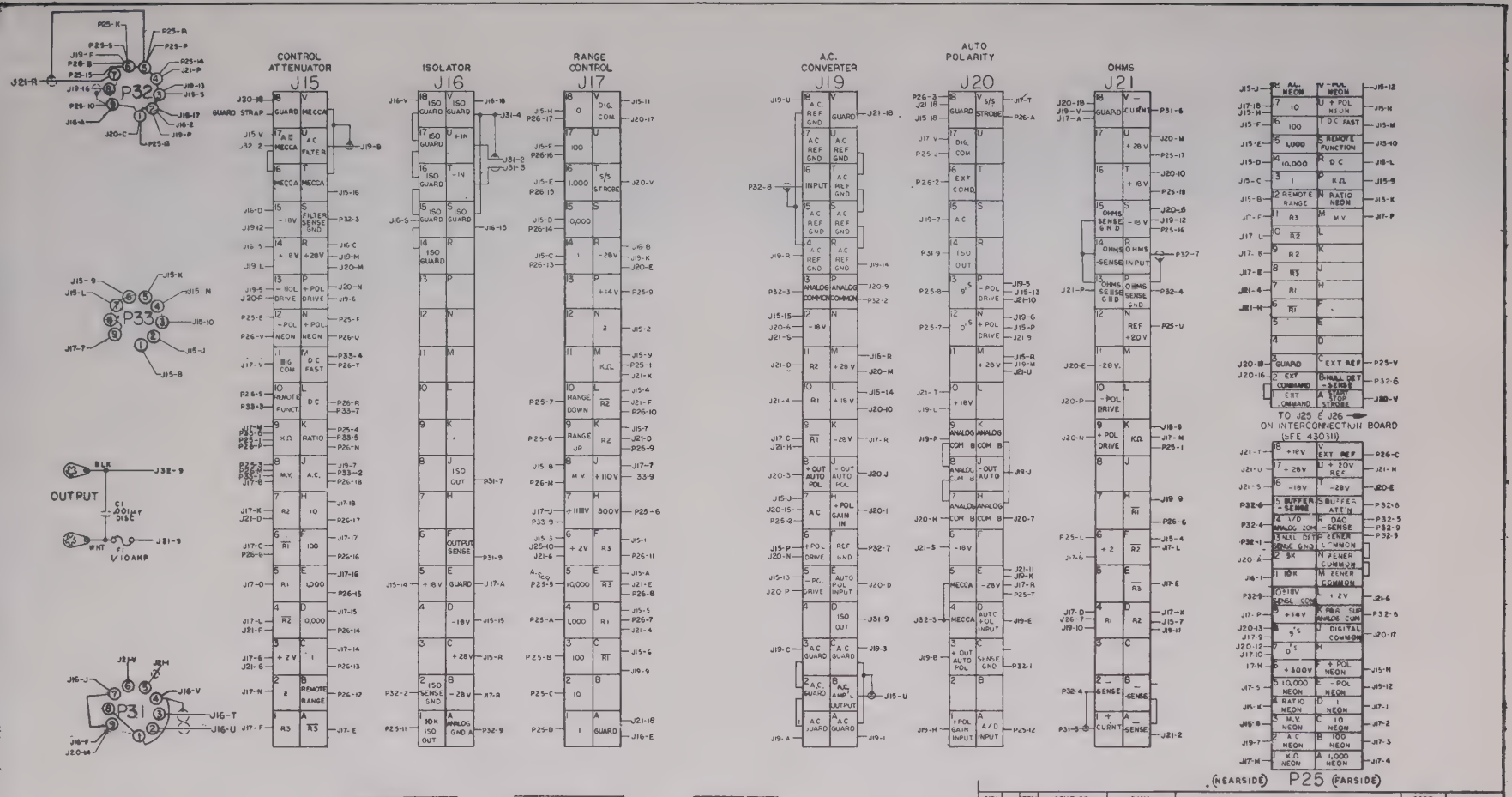
Intraconnection - 130 Module	430707
Intraconnection - 112 Module	430636
Intraconnection - 5500	430688
Interconnection	430397
Assembly, Control and Attenuator, 130	402553*
Schematic, Control and Attenuator, 130	430705*
PC Board Assembly, Attenuator, 130	402031
PC Board Assembly, Switch Panel, 130	402552
PC Board Assembly, Switch Panel, 130	402954*
Assembly, Filter and Attenuator 112	402443
Schematic, Filter and Attenuator 112	430638
PC Board Assembly, Attenuator, 112	402441
PC Board Assembly, Filter, 112	402442
PC Board Assembly, Function Control, 112	402444
PC Board Assembly, Function Control, 112	402957*
Schematic, Function Control, 112	430639
PC Board Assembly, Isolator	402477
Schematic, Isolator	430659
PC Board Assembly, Range Control, 130	402667
Schematic, Range Control, 130	430758
PCB Assembly, Range Control, 130	403114*
Schematic, Range Control, 130	430844*
PC Board Assembly, Range Control, 112	402440
Schematic, Range Control, 112	430637
PC Board Assembly, Range Control, 112	402696*
Schematic, Range Control, 112	430761*
PC Board Assembly - AC Converter	400706
Schematic - AC Converter	430306
PC Board Assembly - AC Converter	402102
Schematic - AC Converter	430437
PC Board Assembly - Auto Polarity	402036
Schematic - Auto Polarity	430406
PC Board Assembly - Ohms Converter	402101
Schematic - Ohms Converter	430436
PC Board Assembly - Ohms Converter	402551*
Schematic - Ohms Converter	430714*
PC Board Assembly, Function Indicator	402100
PC Board Assembly - Display	400890
Schematic - Display	430389
PC Board Assembly - BCD Decade	400891
Schematic - BCD Basic Decade	430390

* Used on later production runs

DRAWINGS (Continued)

PC Board Assembly, DAC	400896
Schematic, DAC	430376
PC Board Assembly - Null Detector	400892
Schematic - Null Detector	430379
PC Board Assembly - Sequence Logic	400894
Schematic - Sequence Logic	430393
PC Board Assembly - Control Logic	402501
Schematic - Control Logic	430685
PC Board Assembly - Reference and Buffer Amplifier	400895
Schematic - Reference and Buffer Amplifier	430395
Assembly, Power Supply	402314
PC Board Assembly - Power Supply	402317
Schematic - Power Supply	430399
Assembly - Capacitor	402019

Drawings for the Output-Programming Option follow the above drawings in the order listed in figure 6.1.



J 31 PIN FUNCTIONS	
PIN	FUNCTION
1	MECCA
2	+ ISC INPUT
3	- ISC INPUT
4	MECCA
5	+ CURRENT
6	- CURRENT
7	SC OUTPUT
8	MECCA
9	ISOLATOR OUT

J 32 PIN FUNCTIONS	
PIN	FUNCTION
1	AUTO POL SENSE GND
2	MECCA POL SENSE GND
3	MECCA FILTER SENSE GND
4	MECCA SENSE GND
5	MECCA ZENER COM
6	MECCA HUP PWR COM
7	OHMS INPUT
8	AC INPUT
9	MECCA 28V REF @

J 33 PIN FUNCTIONS	
PIN	FUNCTION
1	MV
2	AC
3	REMOTE
4	DC FAST
5	RATIO
6	K OHMS
7	DC
8	SPARE
9	110 V

QTY REQD	SYM	ITEM NO.	GOVT OR VENDOR NO.	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION

LIST OF MATERIAL OR PARTS LIST

402586	130	REF	REF	
NEXT ASSY	USED ON	NA	FA	
APPLICATION		QTY REQD		

MATERIAL

APPLIED FINISH

HEAT TREATMENT

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON DECIMALS | ANGLES
.X ± .030 ± 0° 30'
.XX ± .020
.XXX ± .010
FORMED ANGLES ± 1.0°
ECCENTRICITY BETWEEN DIA ON THE SAME AXIS SHALL NOT EXCEED .010 TIR.
INTERPRET DRAWINGS IN ACCORDANCE WITH STANDARDS MIL-D-1000 AND MIL-D-70327

CONTRACT NO.

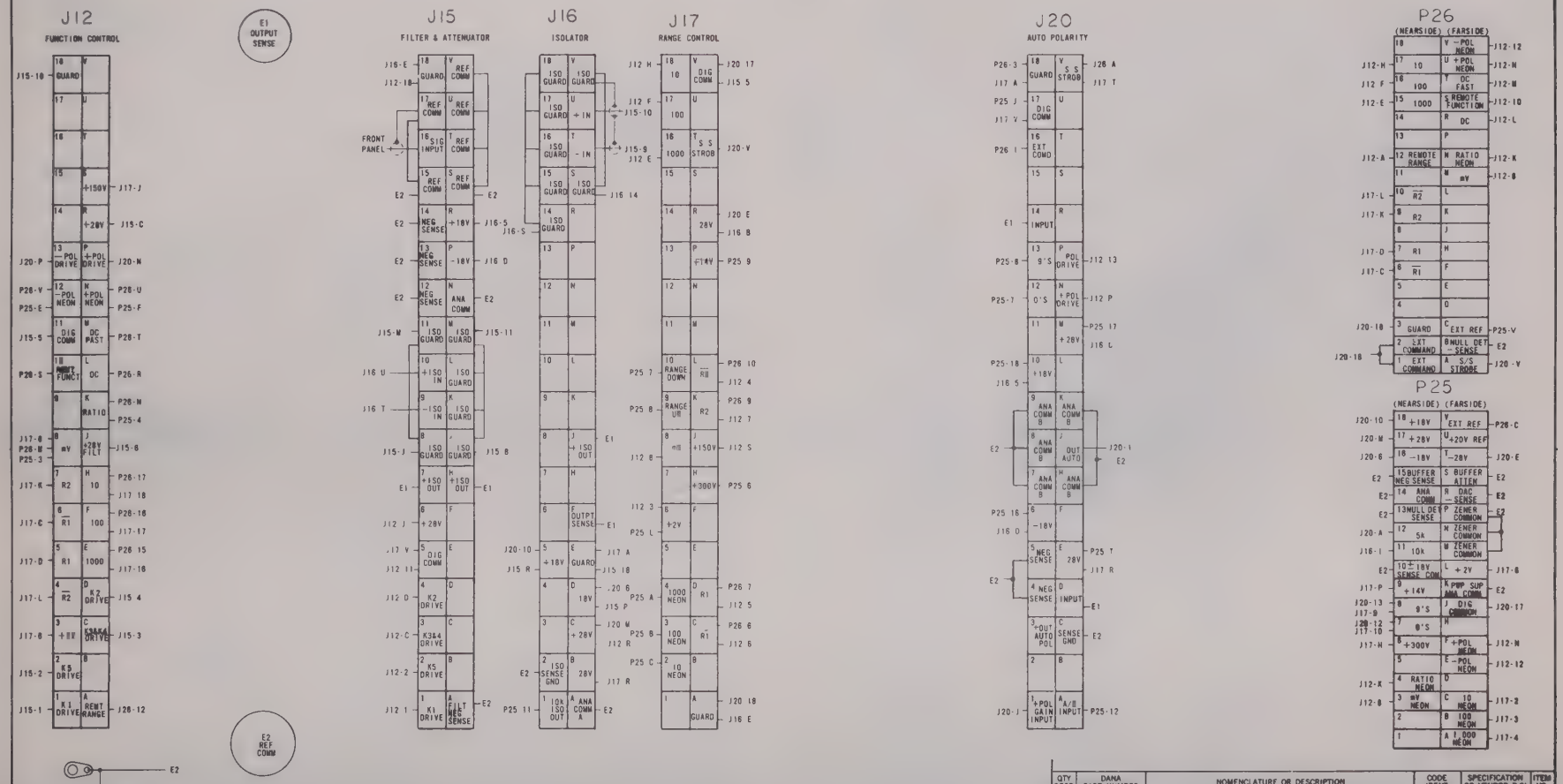
NAME	DATE
DR	30 SEPT 66
CHK	7/9/67
APPD	7/10/67
	11/1/67

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

WIRING DIAGRAM - INTRACONNECTION,

SIZE	CODE IDENT NO.	DWG NO.	
D	21793	430707	C
SCALE	WT	SHEET 1 OF 1	

1. CONNECTORS VIEWED FROM WIRING (DIP PIN) SIDE.
2. UNLESS OTHERWISE SPECIFIED



NOTE: UNLESS OTHERWISE SPECIFIED

QTY REQD	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION OR VENDOR P/N	ITEM NO.

LIST OF MATERIAL OR PARTS LIST

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON: DECIMALS X .02 XX .010 XXX .005; ANGLES 0° 30'; FORMED ANGLES ±.0

MATERIAL

FINISH

CONTRACT NO.

DRAWN	KW ROMAHN	2367
CHECK		
COG. ENGR		
PROJ ENGR		

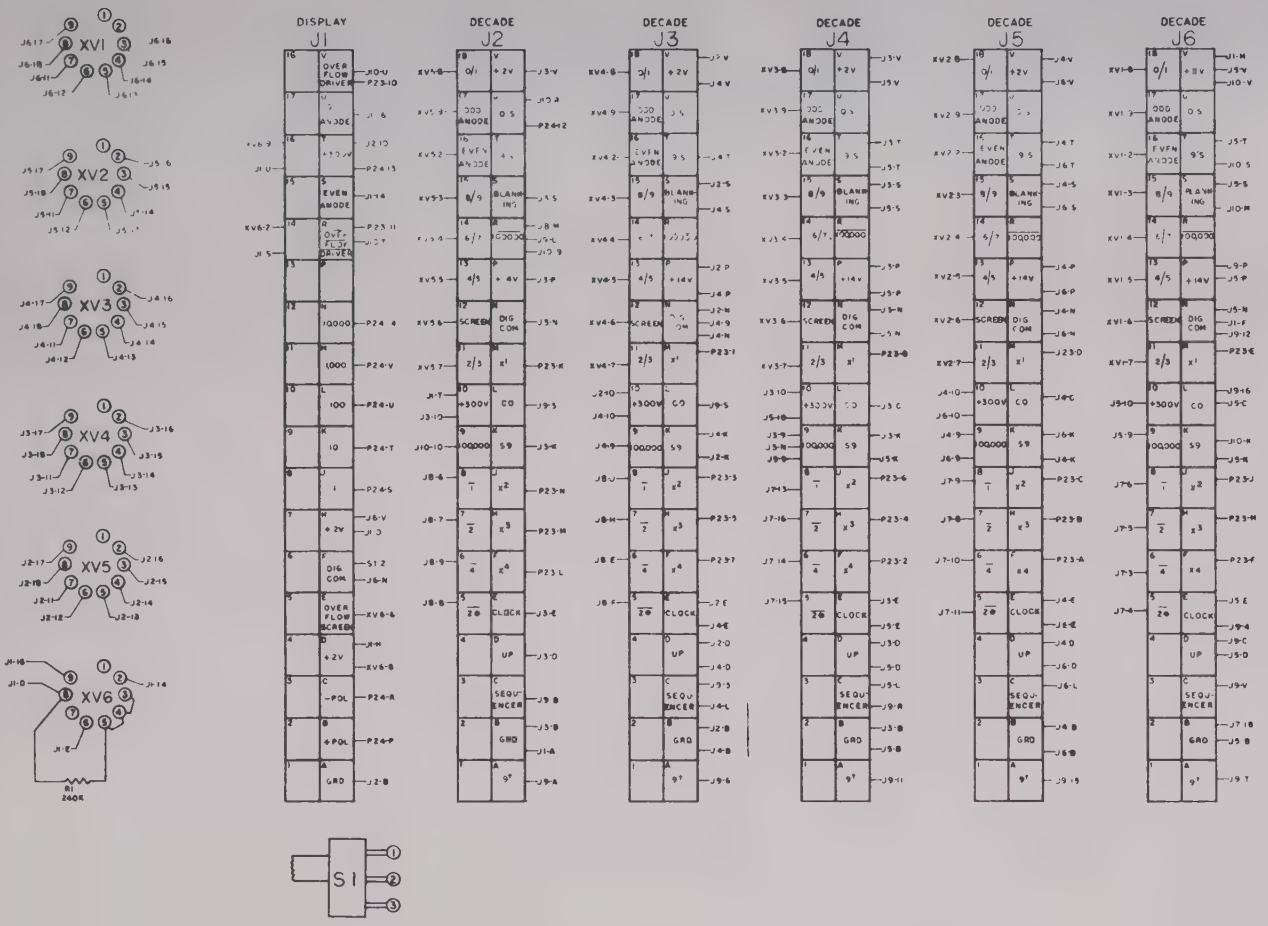
DANA LABORATORIES INC.
IRVINE, CALIFORNIA

WIRING DIAGRAM INTRACONNECTION 112

SIZE	CODE IDENT NO.	DWG NO.	REV
D	21793	430636	

SCALE NONE | WT | SHEET 1 OF 1

402445	5500-112	1	1
NEXT ASSY	USED ON	NA	FA
APPLICATION		QTY REQD	

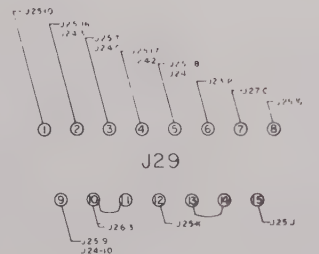


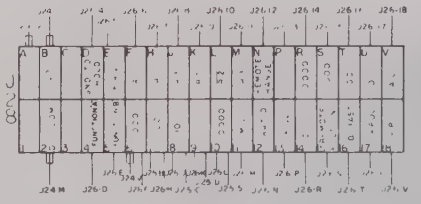
SEE SHEET 1 OF 2

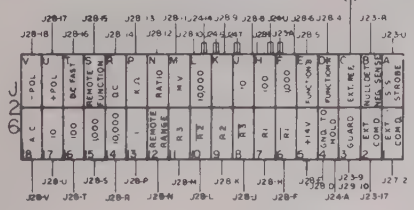
NOTES: UNLESS OTHERWISE SPECIFIED

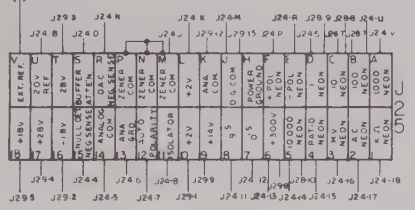
DANA LABORATORIES INC. IRVINE, CALIFORNIA		
WIRING DIAGRAM- INTRACONNECTION, 5503 D.V.M. A.D.C.		
SIZE: D	CODE IDENT NO.: 21793	DWG NO.: 430688 A
SCALE:	WT:	SHEET 2 OF 2

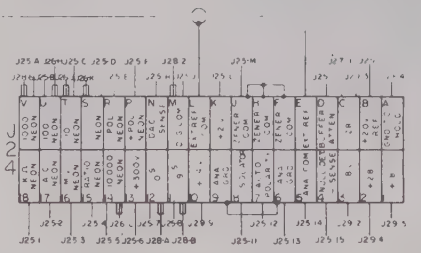
J29 PIN FUNCTIONS	
PIN	FUNCTION
1	+2 V
2	−18 V
3	−28 V
4	+28 V
5	+18 V
6	+40 V
7	+ [illegible] ISOLATED
8	+300 V
9	+14 V
10	GUARD
11	GUARD
12	ANA. COMMON
13	SPARE
14	SPARE
15	DIG. COMMON

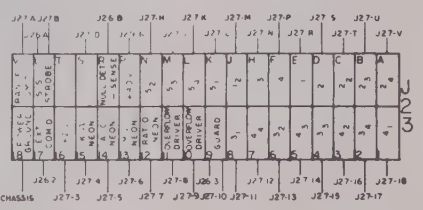












2. [illegible] CONSIST PARTIALLY OF 22 GA TYPE3 [illegible] WIRE (P/N [illegible])

1. [illegible] FROM REAR OF [illegible]; TYPE J 23, J 24, J 25 AND J 26 ARE AS PER [illegible]

NOTES: UNLESS OTHERWISE SPECIFIED

QTY REQD	SYM	ITEM NO	GOVT OR VENDOR NO.	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION

LIST OF MATERIAL OR PARTS LIST

702001	54 3/250C	C&F	H&E
NEXT ASSY	USED ON	PA	FA
APPLICATION		QTY REQD	

MATERIAL

APPLIED FINISH

HEAT TREATMENT

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
DECIMALS: X ± .030, XX ± .020, XXX ± .010
ANGLES: ± 0° 30'
FORMED ANGLES ± 1.0°
ECCENTRICITY BETWEEN DIA ON THE SAME AXIS SHALL NOT EXCEED .010 TIR
INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS MIL D-1000 AND MIL D-70327

CONTRACT NO.

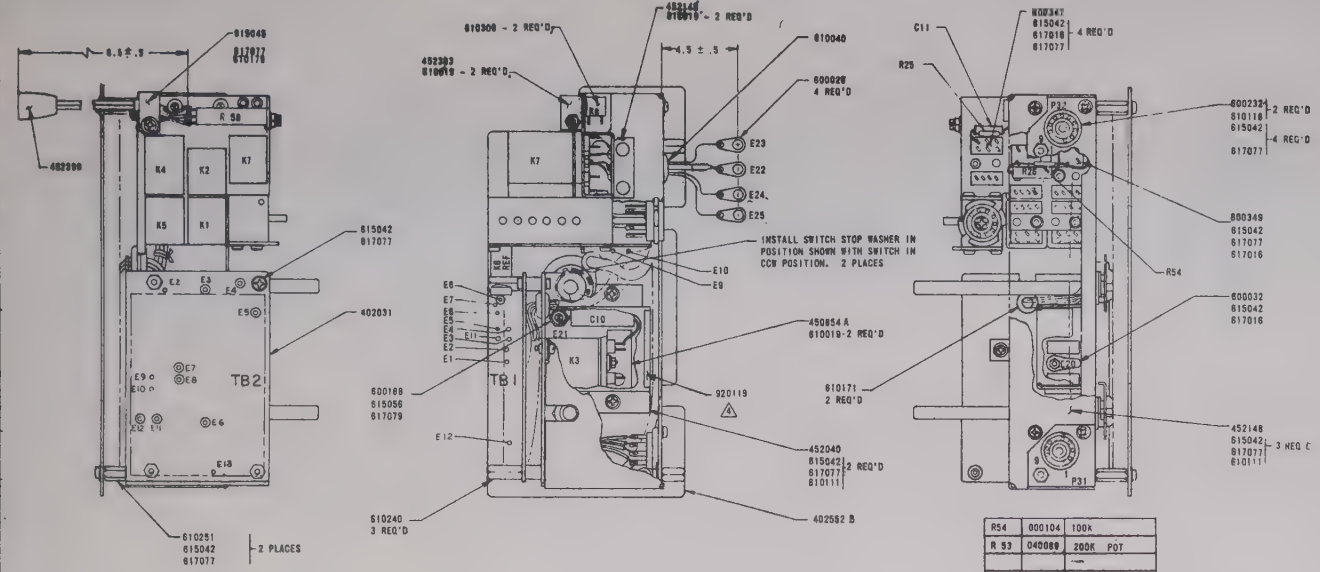
NAME	DATE
DR A CHAUSSEE	4 21 66
CHK — M Coglia	4/26/66
APPD J. Pace	5/1/66

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

WIRING DIAGRAM — INTERCONNECTION.

SIZE	CODE IDENT NO.	DWG NO.
D		430397

SCALE — WT — SHEET 1 OF 1



REF DES	PART NO.	DESCRIPTION
R54	000104	100K
R 53	040089	200K POT
R26	010184	887 K 1%
R25	010344	237k1%
K8	310871	RELAY-BABCOCK
K7	310829	RELAY
K5	310829	"
K4	310829	"
K3	310829	"
K2	310829	"
K1	310829	RELAY
C11	121148	.0047 UF 100V
C10	120067	.22UF 200V

REF DES OR ITEM	P/N	DESCRIPTION	QTY
	402031	PCB ASSY ATTEN	1
	402100	FUNCTION IND ASSY	1
	402552	PCB ASSY SWITCH PANEL	1
	430705	SCHEM CONTROL ATTENUATOR	REF
	430715	WIRING LIST CONT & ATTENUATOR 130	REF
	450854	BRKT RELAY MTG MULTI POLE	1
	452040	SHIELD RELAY	1
	452147	CHASSIS CONTROL & ATTENUATOR	1
	452148	SHIELD CONTROL & ATTEN FRONT	1
	452149	SHIELD CONT & ATTEN RELAY FRONT	1
	452383	BRKT POT MTG	1
	452399	CABLE COLDED HOOD	1
	500002	TUBING SHRINK	A/R
	600026	LUG SOLDER NO.10	4
	600032	LUG SOLDER NO.4	1
	600188	TERMINAL INSUL	1
	600232	SOCKET 9 PIN -	2
	600347	SOCKET RELAY 2 POLE	5
	600349	SOCKET RELAY 4 POLE	1
	610019	RIVET 1/8 SEMI-TUBE X 5/32 LG	6

REF DES OR ITEM	P/N	DESCRIPTION	QTY
	610040	GROMMET RUB 1/4 I.D. X 3/8	1
	610111	NUT PRESS 4-40	6
	610118	STANDOFF 4-40 X 3/8 LG X 1/4 HEX	2
	610171	GROMMET VIN 5/16 O.D. X 3/16 I.D.	2
	610179	CLAMP CABLE	1
	610240	STANDOFF 440	3
	610251	STANDOFF-SW 440	2
	610258	STANDOFF-4-40 X 5/16 LG X 1/4 HEX	2
	610257	STANDOFF-SW 4-40 X 31 LG X 1/40	2
	610306	WASHER-FLAT	2
	615042	SCREW PPH 4-40 X 1/4	22
	615045	SCREW PPH 4-40 X 7/16	1
	615058	SCREW PPH 6-32 X 3/16	1
	617016	NUT-HEX 4-40 RADIO	8
	617077	WASHER INT LOCK NO.4	22
	617079	WASHER INT LOCK NO.6	1
	920026	SOLDER WIRE	A/R
	920119	EXTRUSION-RUBBER	A/R

RELAY TERMINAL LAYOUTS

⚠ RUBBER EXTRUSION TO BE BONDED USING EASTMAN 910 ADHESIVE P/N 920008

3. REFERENCE WIRE LIST 430715
2. ASSEMBLY PROCEDURES AND PROCESSES TO CONFORM TO [illegible] STANDARDS
1. SCHEMATIC REFERENCE 430705A

UNLESS OTHERWISE SPECIFIED

QTY REQD	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION OR VENDOR P/N	ITEM NO.
		LIST OF MATERIAL OR PARTS LIST			
402039	130				1
NEXT ASSY	USED ON		MA	FA	
APPLICATION			QTY REQD		

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON: DECIMALS .XX ±.030 .XXX ±.010 | ANGLES 0° 30' | FORMED ANGLES ±1°

MATERIAL

FINISH

CONTRACT NO.

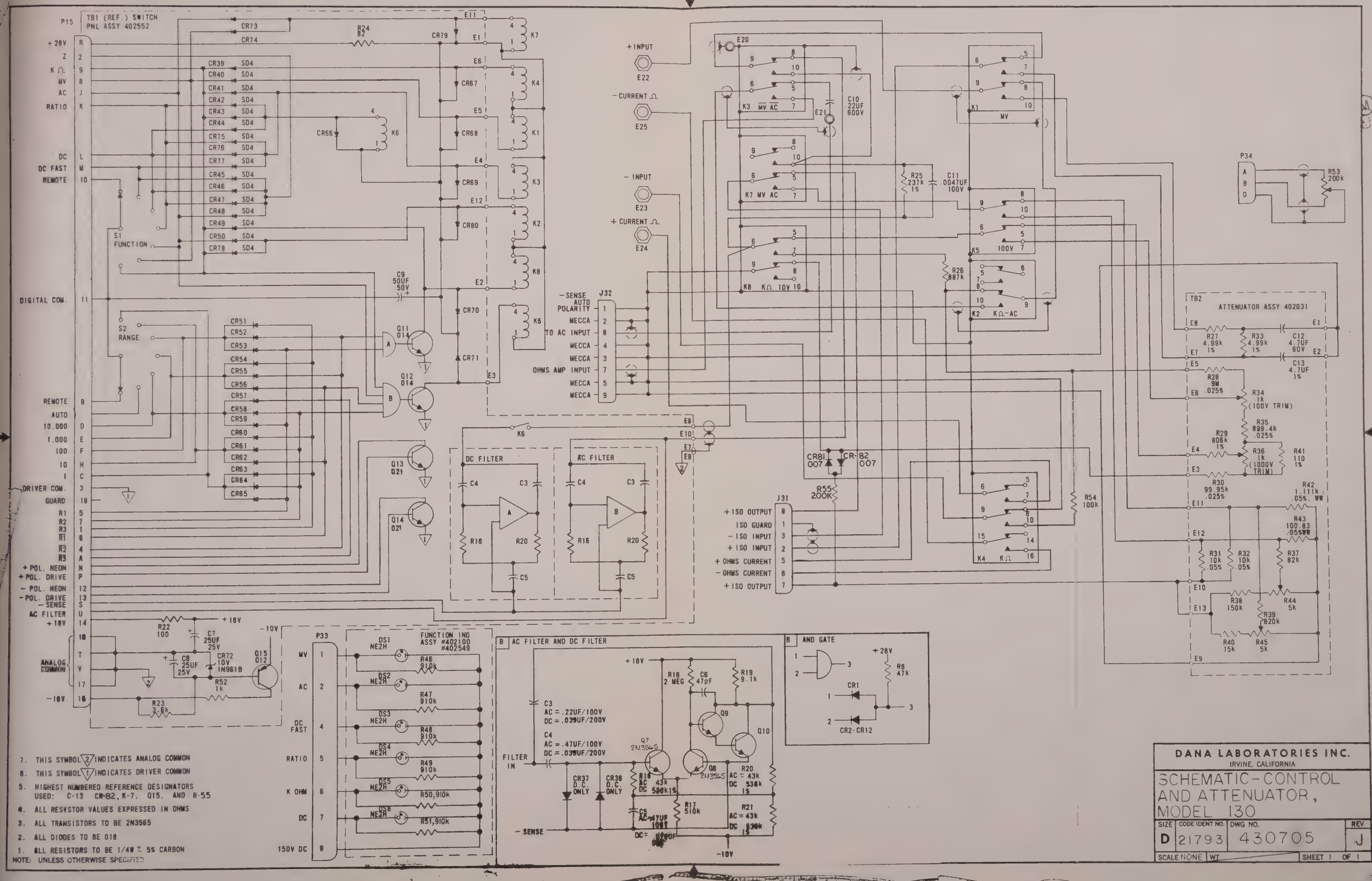
DANA LABORATORIES INC.
IRVINE, CALIFORNIA

DRAWN	R PRCHAL	10/6/
CHECK	J MILLER	10/6/
COG. ENGR		
PROJ. ENGR		
		10/6/

CONTROL & ATTENUATOR ASSY

SIZE D | CODE IDENT NO. 21793 | DWG NO. 402553 | REV. H

SCALE FULL | WT. | SHEET 1 OF 1



7. THIS SYMBOL (2) INDICATES ANALOG COMMON
8. THIS SYMBOL (1) INDICATES DRIVER COMMON
5. HIGHEST NUMBERED REFERENCE DESIGNATORS USED: C-13 CR-82, K-7, Q15, AND R-55
4. ALL RESISTOR VALUES EXPRESSED IN OHMS
3. ALL TRANSISTORS TO BE 2N3565
2. ALL DIODES TO BE 018
1. ALL RESISTORS TO BE 1/4W ± 5% CARBON

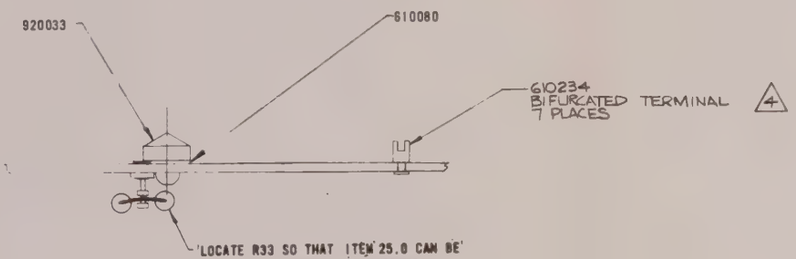
NOTE: UNLESS OTHERWISE SPECIFIED

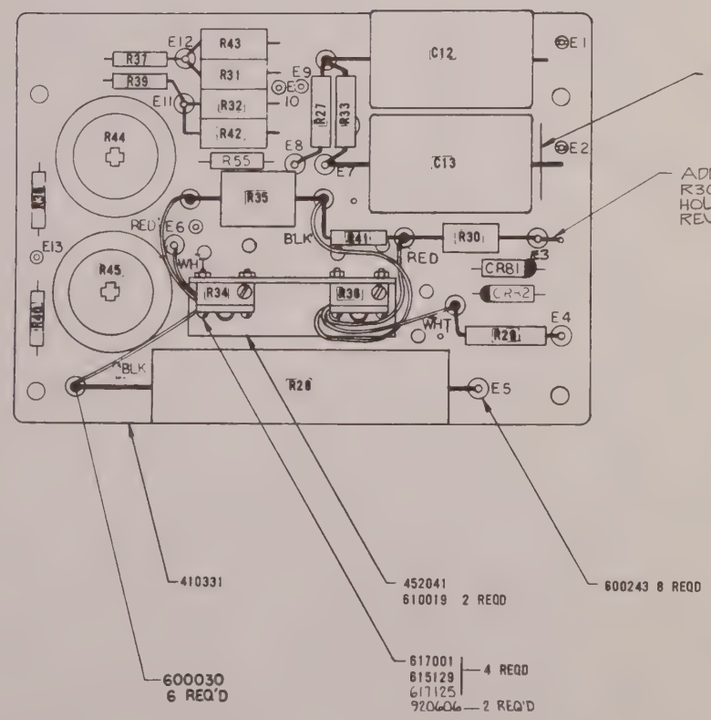
DANA LABORATORIES INC.
IRVINE, CALIFORNIA

SCHEMATIC-CONTROL AND ATTENUATOR, MODEL 130

SIZE	CODE IDENT NO.	DWG NO.	REV
D	21793	430705	J

SCALE NONE | WT | SHEET 1 OF 1





REF DES OR ITEM	P/N	DESCRIPTION	QTY
C12	120081	CAP-4.7MF 60V	2
C13	120081	CAP-4.7MF 60V	REF
CR81	211236	DIODE 007	2
CR82	211236	DIODE 007	REF
R27	010020	RES 4.99k, 1%	2
R28	020124	RESISTOR SET-SEE SPEC	1
R29	010185	RES 806k, 1%	1
R30	020124	RESISTOR SET	REF
R31	020241	RES 10k, .05%	2
R32	020241	RES 10k, .05%	REF
R33	010020	RES 4.99k, 1%	REF
R34	040033	RES 1k POT	2
R35	020124	RESISTOR SET	REF
R36	040033	RES 1k POT	REF
R37	000823	RES 82k	1
R38	000154	RES 150k	1
R39	000824	RES 820k	1
R40	000153	RES 15k	1
R41	010161	RES 110 OHMS, 1%	1
R42	020204	RES 1.111k .05%	1
R43	020170	RES 100 83 OHMS 1%	1
R44	040053	RES 5k POT	2
R45	040053	RES 5k POT	REF
R55	000204	RES 200K	1
	410331	PC BD ATTENUATOR	1
	452041	BRACKET POT MTG	1
	500004	WIRE BUSS	A/R
	600030	TERMINAL-TEFLON	6
	600243	TERMNL-FEEDTHRU	8
	610019	RIVET 1/8 SEMI-TUB X 5/32 LG	2
	610080	WASHER NYLON	1
	615129	SCR SPH 0-80 X 3/8	4
	617001	HEX NUT 0 80 STD	4
	920010	SOLDER BAR	A/R
	920026	SOLDER-WIRE	A/R
	920033	BUMPER	1
	610234	BIFURCATED TERM	6
	617125	LOCKWASHER	4
	920606	RETAINER STRAP POT	2

ALTERNATE WIRE COLOR CHART	
STD. COLOR	ALT. COLOR
BLACK	GREEN
WHITE	RED
RED	YELLOW

4 ALL 610234 TERMINAL ARE TO BE SOLDERED TO THE CIRCUITRY.

3. ASSEMBLY PROCEDURES AND PROCESSES TO CONFORM WITH DANA WORKMANSHIP STANDARDS.
2. SCHEMATIC REFERENCE: 430705
1. ALL RESISTORS TO BE 1/4 W, ± 5% CARBON

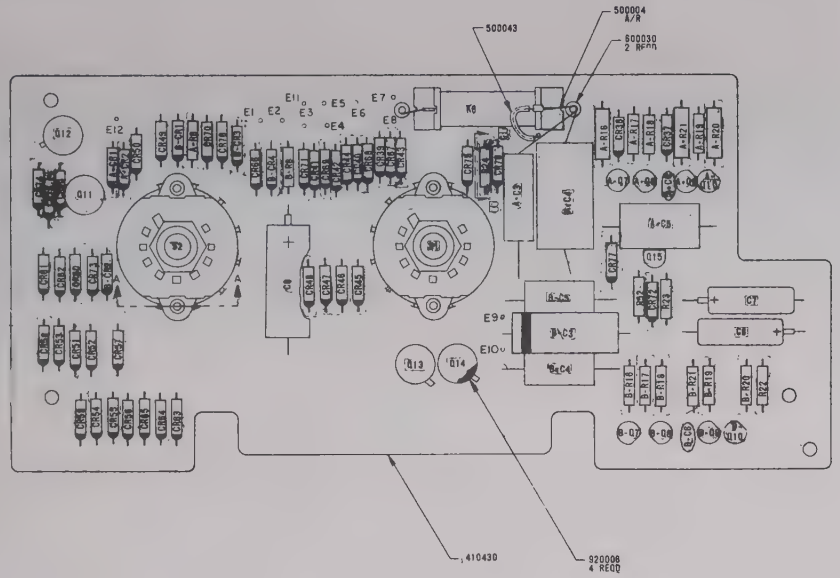
NOTE: UNLESS OTHERWISE SPECIFIED

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

P.C. BOARD ASSY-
ATTENUATOR, 130

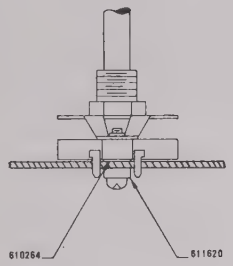
SIZE	CODE IDENT NO.	DWG NO.	REV
D	21793	402031	J

SCALE 2/1 | WT | SHEET 1 OF 1



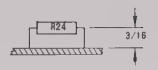
SECTION A-A

TYP 4 PLACES



SECTION B-B

TYP 1 PLACE



REF DES OR ITEM	P/N	DESCRIPTION	QTY
A-C3	120168	.039 UF/200V	2
A-C4	120168	.039 UF/200V	REF
A-C5	120169	.078 UF/50V	1
A-C6	101182	47PF	2
B-C3	121393	.22 UF/100V	1
B-C4	120026	.47 UF/100V	2
B-C5	120026	.47 UF/100V	REF
B-C6	101182	47 PF	2
C7	110043	25 UF/25V	2
C8	110043	25 UF/25V	REF
C9	110044	50 UF/50V	1
A-CR1	211083	018	33
A-CR2	↓	↓	↓
B-CR1	↓	↓	↓
B-CR2	↓	↓	↓
B-CR3	↓	↓	↓
B-CR4	211083	018	REF
CR37	211083	018	REF
CR38	211083	018	REF
CR39	210004	SD-4	16
CR40	210004	SD-4	REF
THRU	↓	↓	↓
CR50	210004	SD-4	REF
CR51	211083	018	REF
THRU	↓	↓	↓
CR71	211083	018	REF
CR72	220044	1N9618, ZENER	1
CR73	211083	018	REF
CR74	211083	018	REF
CR75	210004	SD-4	REF
THRU	↓	↓	↓
CR78	210004	SD-4	REF
CR79	211083	018	REF
CR80	211083	018	REF
K6	310013	RELAY	1

REF DES OR ITEM	P/N	DESCRIPTION	QTY
A-Q7	200043	2N3565	8
A-Q8	200043	2N3565	REF
A-Q9	200043	2N3565	REF
A-Q10	↓	↓	↓
B-Q7	↓	↓	↓
B-Q8	↓	↓	↓
B-Q9	↓	↓	↓
B-Q10	200043	2N3566	REF
Q11	200035	014	2
Q12	200035	014	REF
Q13	200079	Q21	2
Q14	200079	Q21	REF
Q15	200022	012	1
A-R8	000473	47K	8
A-R16	010348	536K, 1%	8
A-R17	000514	510K	2
A-R18	000205	2M	2
A-R19	000912	9.1K	2
A-R20	010348	536K, 1%	REF
A-R21	010348	536K, 1%	REF
B-R16	000433	43K	8
B-R17	000514	510K	REF
B-R18	000205	2M	REF
B-R19	000912	9.1K	REF
B-R20	000433	43K	REF
B-R21	000433	43K	REF
R22	000101	100 OHMS	1
R23	000362	3.6K	1
R24	000820	82 OHMS	1
R52	000702	1K	1
S1	600236	SWITCH	1
S2	600218	SWITCH	1
	610430	PCB SW PNL	1
	500004	WIRE 22 GA BUSS	A/R
	500043	WIRE24 GA TEF	A/R
	600030	TERMINAL	2
	610264	WASHER-INSUL	4
	611620	WASHER-FIBER	4
	920006	TRANS PAD	4
	920010	SOLDER-BAR	A/R
	920026	SOLDER-WIRE	A/R

QTY REQD	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION OR VENDOR P/N	ITEM NO.

LIST OF MATERIAL OR PARTS LIST

4 PAGES 2/3 ARE "A" SIZE.

3. SCHEMATIC REFERENCE 430195

2. ASSEMBLY PROCEDURES AND PROCESSES TO CONFORM WITH DANA WORKMANSHIP STANDARDS.

1. ALL RESISTORS ARE 1/4 W, ± 5%, CARBON

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON: DECIMALS X .030 XX .010 XXX .005 | ANGLES 0° 30' | FORMED ANGLES 1.0

MATERIAL

FINISH

CONTRACT NO.

DRAWN P. H. MAHN 9 IE 67

CHECK I. MARSHE

COG ENGR

PROJ ENGR

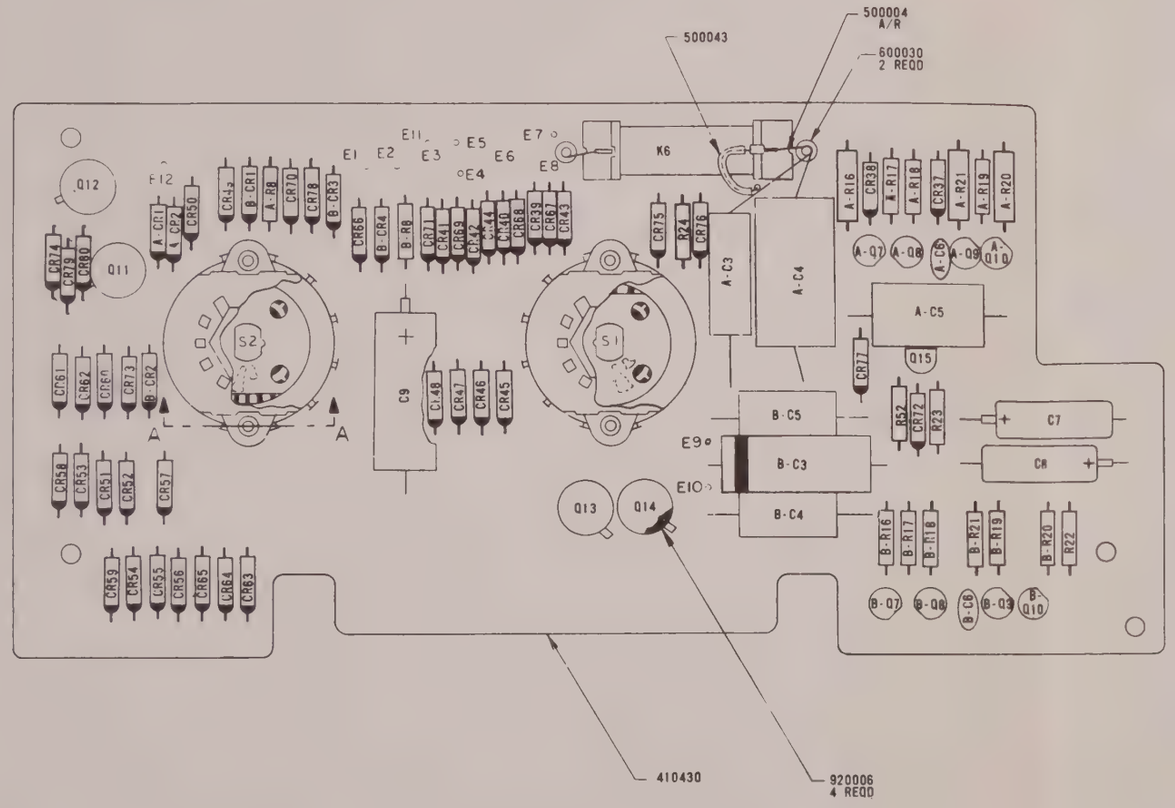
DANA LABORATORIES INC.
IRVINE, CALIFORNIA

PC BOARD ASSEMBLY-
SWITCH PANEL

SIZE	CODE IDENT NO.	DWG NO.	REV
D	21793	402552	C

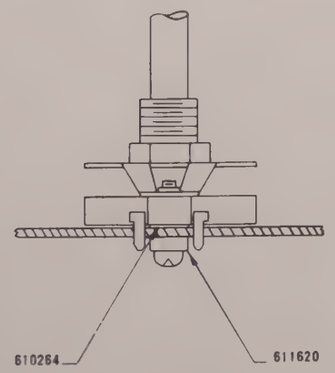
SCALE 2/1 WT SHEET 1 OF 1

402553	130	1	1
NEXT ASSY	USED ON	NA	FA
APPLICATION		QTY REQD	



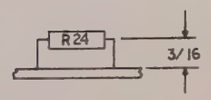
SECTION A-A

TYP 4 PLACES



SECTION B - B

TYP 1 PLACE



REF DES OR ITEM	P/N	DESCRIPTION	QTY
A-C3	120168	.039 UF /200V	2
A-C4	120168	.039 UF /200V	REF
A-C5	120169	.078 UF /50V	1
A-C6	101182	47 PF	2
B-C3	121393	.22 UF /100V	1
B-C4	120026	.47 UF /100V	2
B-C5	120026	.47 UF /100V	REF
B-C6	101182	47 PF	2
C7	110043	25 UF /25V	2
C8	110043	25 UF /25V	REF
C9	110044	50 UF /50V	1
A-CR1	211083	018	33
A-CR2	↕	↕	↕
B-CR1	↕	↕	↕
B-CR2	↕	↕	↕
B-CR3	↕	↕	↕
B-CR4	211083	018	REF
↕	↕	↕	↕
CR37	211083	018	REF
CR38	211083	018	REF
CR39	210004	SD-4	16
CR40	210004	SD-4	REF
THRU	↕	↕	↕
CR50	210004	SD-4	REF
CR51	211083	018	REF
↕	↕	↕	↕
THRU	↕	↕	↕
↕	↕	↕	↕
CR71	211083	018	REF
CR72	220044	1N9616, ZENER	1
CR73	211083	018	REF
CR74	211083	018	REF

REF DES OR ITEM	P/N	DESCRIPTION	QTY
CR75	210004	SD-4	REF
↕	↕	↕	↕
THRU	↕	↕	↕
↕	↕	↕	↕
CR78	210004	SD-4	REF
CR79	211083	018	REF
CR80	211083	018	REF
KC	310013	RELAY	1
A-Q7	200043	2N3565	4
A-Q8	200043	2N3565	REF
A-Q9	200043	2N3565	REF
A-Q10	200043	2N3565	REF
B-Q7	200043	2N3565	REF
B-Q8	200043	2N3565	REF
B-Q9	200043	2N3565	REF
B-Q10	200043	2N3565	REF
Q11	200035	Q14	2
Q12	200035	Q14	REF
Q13	200079	Q21	2
Q14	200079	Q21	REF
Q15	200022	Q12	1
A-R8	000473	47K	2
A-R16	010348	536K, 1%	3
A-R17	000514	510K	2
A-R18	000205	2M	2
A-R19	000912	9.1K	2
A-R20	010348	536K, 1%	REF
A-R21	010348	536K, 1%	REF
B-R16	000433	43K	3
B-R17	000514	510K	REF
B-R18	000205	2 M	REF

REF DES OR ITEM	P/N	DESCRIPTION	QTY
B-R19	000912	9.1K	REF
B-R20	000433	43K	REF
B-R21	000433	43K	REF
R22	000101	100 OHMS	1
R23	000362	3.6K	1
R24	000820	82 OHMS	1
R52	000102	1K	1
S1	600416	SWITCH	1
S2	600415	SWITCH	1
	410430	PCD SW PNL	1
	500004	WIRE 22 GA BUSS	A/R
	500043	WIRE 24 GA TEF	A/R
	600030	TERMINAL	2
	610264	WASHER-INSUL	4
	611620	WASHER-FIBER	4
	920006	TRANS PAD	4
	920010	SOLDER-BAR	A/R
	920026	SOLDER-WIRE	A/R

4 PAGES 2 & 3 ARE "A" SIZE.

3. SCHEMATIC REFERENCE: 430705
2. ASSEMBLY PROCEDURES AND PROCESSES TO CONFORM WITH DANA WORKMANSHIP STANDARDS.
1. ALL RESISTORS ARE 1/4 W, ± 5%, CARBON

NOTE: UNLESS OTHERWISE SPECIFIED

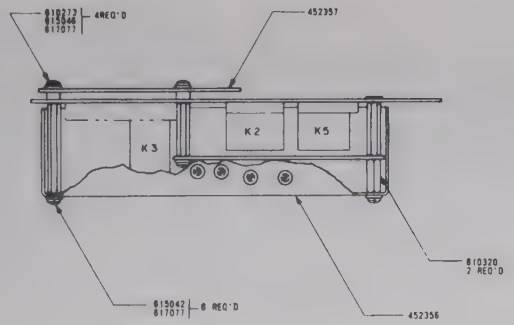
LIETZ 1980 ZOPFLIGHT

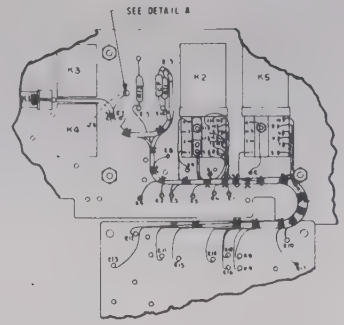
DANA LABORATORIES INC.
IRVINE, CALIFORNIA

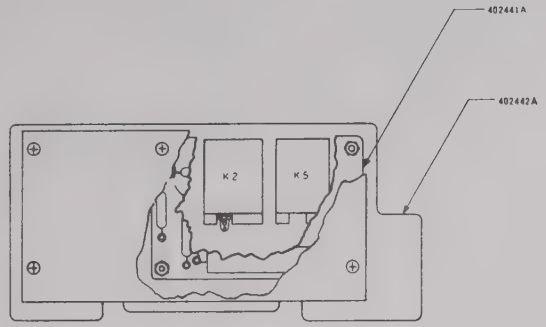
PC BOARD ASSEMBLY-SWITCH PANEL

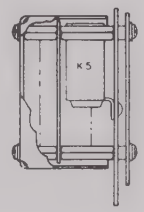
SIZE	CODE IDENT NO.	DWG NO.	REV
D	21793	402954	D

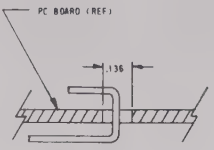
SCALE 2/1 | WT | SHEET 1 OF 1











DETAIL A
SCALE 4:1

P/N	DESCRIPTION	QTY
402441	PCB - ASSY-ATTEN FILTER & ATTEN	1
402442	PCB ASSY FILTER ATTEN	1
430838	SCHEMATIC	REF
452356	SHIELD-FRONT FILT & ATTEN 112	1
452357	SHIELD-REAR FILT & ATTEN 112	1
500023	WIRE-BUSS 24 GA	A/R
500046	WIRE-24 GA TEFLON BLUE	A/R
500047	WIRE-24 GA TEFLON GREEN	A/R
501446	CABLE-RG174/U	A/R
524000	WIRE-24 GA STR 0 COLOR	A/R
524090	WIRE-24 GA STR 0-9 COLOR	A/R
524215	WIRE-24 GA STR 2-1-5 COLOR	A/R
524444	WIRE-24 GA STR 4 COLOR	A/R
524728	WIRE-24 GA STR 7-2-8 COLOR	A/R
524888	WIRE-24 GA STR 8-COLOR	A/R
524918	WIRE-24 GA STR 9-1-8 COLOR	A/R
524944	WIRE-24 GA STR 4	A/R
524912	WIRE-24 GA STR 9-1-2 COLOR	A/R
524913	WIRE 24 GA STR 9-1-3 COLOR	A/R
524914	WIRE 24 GA STR 9-1-4 COLOR	A/R

P/N	DESCRIPTION	QTY
524915	WIRE-24 GA STR 9-1-5 COLOR	A/R
524916	WIRE-24 GA STR 9-1-6 COLOR	A/R
524917	WIRE-24 GA STR 9-1-7 COLOR	A/R
524918	WIRE-24 GA STR 9-1-8 COLOR	A/R
524919	WIRE-24 GA STR 9-1 COLOR	A/R
524924	WIRE-24 GA STR 9-2-4 COLOR	A/R
524927	WIRE-24 GA STR 9-2-7 COLOR	A/R
524929	WIRE-24 GA STR 9-2 COLOR	A/R
524999	WIRE-24 GA STR 9 COLOR	A/R
810273	SPACER SWAGE 1/4D X .125 LG .06 MTG	4
810320	STANDOFF-SWAGE #4-40 X 1/4 DIA X 1-5/8 LG	2
815042	SCREW-PPH 4-40 X 1/4 STLS	8
815046	SCREW- PH 4-40 X 1/2 STLS	4
817077	WASHER-INT LOCK #4 STLS	10
820820	SOLDER-WIRE .03203/37 RESIN CORE	A/R
500002	TUBING-SHRINK 0.153 I.D.	A/R

FROM	TO	CONDUCTOR TYPE & COLOR	P N
TB1-E1	K2 12	9 1	524919
K2 12	TB1 E13	2-1 5	524215
TB1-E2	K2-15	9 2	524929
TB1-E3	K2 9	COAX RG-174 U	501446
SHIELD	ANALOG GRD	0 ⚠3	524000
TB1-E4	TB2 E16	9 1 4	524914
TB1 E5	TB2 E18	9 1 5	524915
TB1 E6	TB2 E17	9 1 6	524918
TB1 E7	TB2-E13	9 1-7	524917
TB1-E8	K2 1	0	524000
K2-1	K5-1	7-2 8	524728
TB1-E9	K2 4	9 2 7	524927
TB1 E10	K2 14	9 1 0	524910
TB1-E11	K5-4	0-9	524090

FROM	TO	CONDUCTOR TYPE & COLOR	P N
K4-8	K5-9	9	524999
TB1-E14	K1	COAX RG 174 U	501446
SHIELD	ANALOG GRD	0 ⚠3	524000
TB1-E15	K2-8	COAX RG 174 U	501446
SHIELD	ANALOG GRD	0 ⚠3	524000
TB2-E8	K2-13	8	524888
TB2-E9	K2 10	9 1 8	524918
TB2 E10	K2 11	4	524444
TB2 E11	K5 10	24 GA TEFLON BLUE	500046
TB2-E12	K5 8	24 GA TEFLON GRN	500047
TB2 E14	K5 5	9 1-2	524912
TB2-E15	K5-3	9-1-3	524913
K2-5,6,7	ANALOG GRD	0 ⚠3	524000
K2-16	K5-6	9-2 4	524924

⚠3 ANALOG GROUND IS AT THE SOLDER LUG OF RELAY K2

2. ASSEMBLY PROCESSES AND PROCEDURES TO CONFORM WITH DANA WORKMANSHIP STANDARDS

1. SCHEMATIC REFERENCE 430838

NOTE UNLESS OTHERWISE SPECIFIED

402448	5500-112	1	1
NEXT ASSY	USED ON	NA	FA
APPLICATION		QTY REQD	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON DECIMALS: X .000, XX .000, XXX .010 | ANGLES 0° 30' | FORMED ANGLES 1.0
MATERIAL
FINISH

CONTRACT NO.

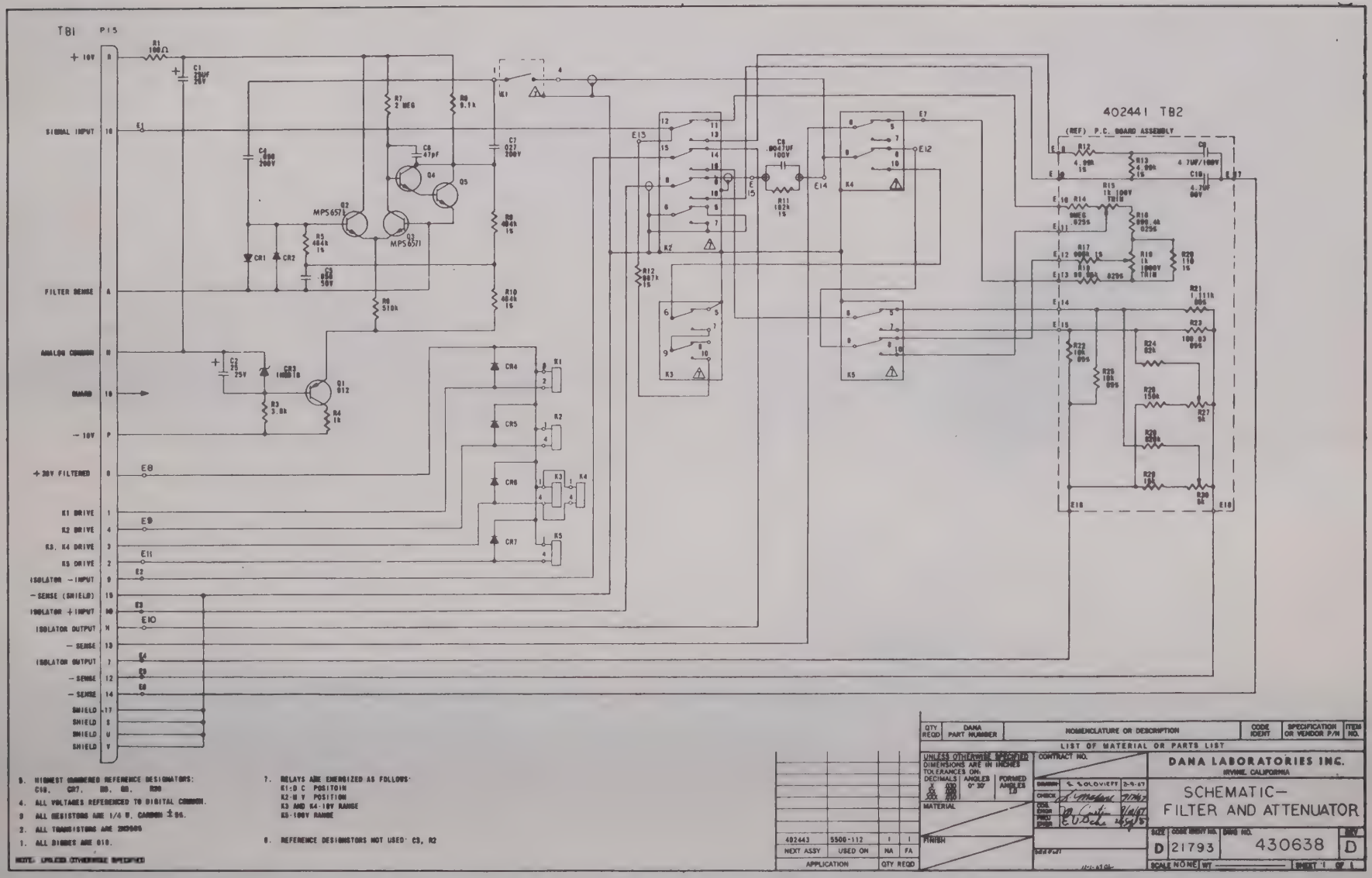
DANA LABORATORIES INC.
IRVINE CALIFORNIA

DRAWN J. GAREAU 12-26-67
CHECK R. Mitchell 12-26-67
DESIGN K. Cole 12-26-67
PROJ ENGR D. Beck 26 Dec 67

ASSEMBLY—FILTER AND ATTENUATOR

SIZE	CODE IDENT NO	DWG NO.	REV
D	21793	402443	D

SCALE FULL WT SHEET 1 OF 1



6. HIGHEST NUMBERED REFERENCE DESIGNATORS:
   C18, CR7, R8, R20
4. ALL VOLTAGES REFERENCED TO DIGITAL COMMON.
3. ALL RESISTORS ARE 1/4 W, CARBON ±5%.
2. ALL TRANSISTORS ARE 2N3905
1. ALL DIODES ARE 610.

NOTE: UNLESS OTHERWISE SPECIFIED

7. RELAYS ARE ENERGIZED AS FOLLOWS:
   K1-D C POSITOIN
   K2-M V POSITION
   K3 AND K4-10V RANGE
   K5-100V RANGE

8. REFERENCE DESIGNATORS NOT USED: C9, R2

QTY REQD	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION OR VENDOR P/N	ITEM NO.

LIST OF MATERIAL OR PARTS LIST

402443	5500-112	1	1
NEXT ASSY	USED ON	MA	FA
APPLICATION		QTY REQD	

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON:
DECIMALS: .X ±.100, .XX ±.050, .XXX ±.010
ANGLES 0° 30'
FORMED ANGLES ±1°
MATERIAL
FINISH

CONTRACT NO.

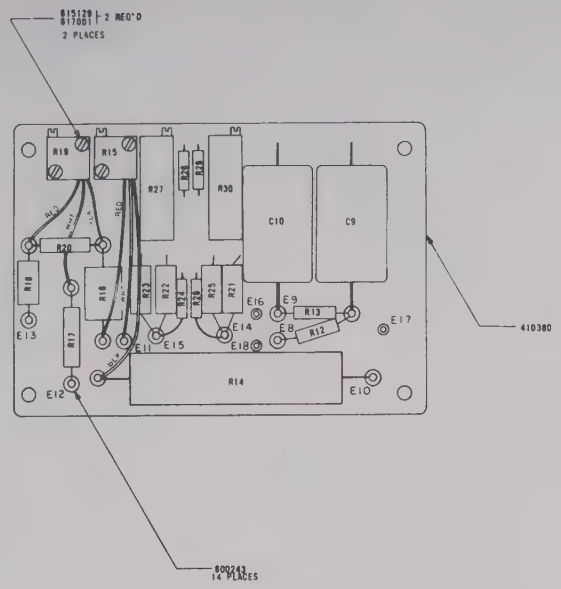
DRAWN	S. GOLOVIEFF	2-9-67
CHECK		
ODL ENGR		
PROJ ENGR		

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

SCHEMATIC— FILTER AND ATTENUATOR

SIZE	CODE IDENT NO.	DWG NO.	REV
D	21793	430638	D

SCALE NONE WT ——— SHEET 1 OF 1



⚠ RESISTORS PART OF MATCHED SET, P/N 029124

3. ASSEMBLY PROCEDURES AND PROCESSES TO CONFORM WITH DANA WORKMANSHIP STANDARDS
2. SCHEMATIC REFERENCE 430038.
1. ALL RESISTORS TO BE 1/4W, ± 5% CARBON.

NOTE: UNLESS OTHERWISE SPECIFIED

QTY REQD	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION OR VENDOR P/N	ITEM NO.
LIST OF MATERIAL OR PARTS LIST					

402443	5500-112	1	1
NEXT ASSY	USED ON	NA	FA
APPLICATION		QTY REQD	

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON:
DECIMALS: X .020, .XX .005, .XXX .010 | ANGLES 0° 30' | FORMED ANGLES T.D.

MATERIAL

FINISH

CONTRACT NO.

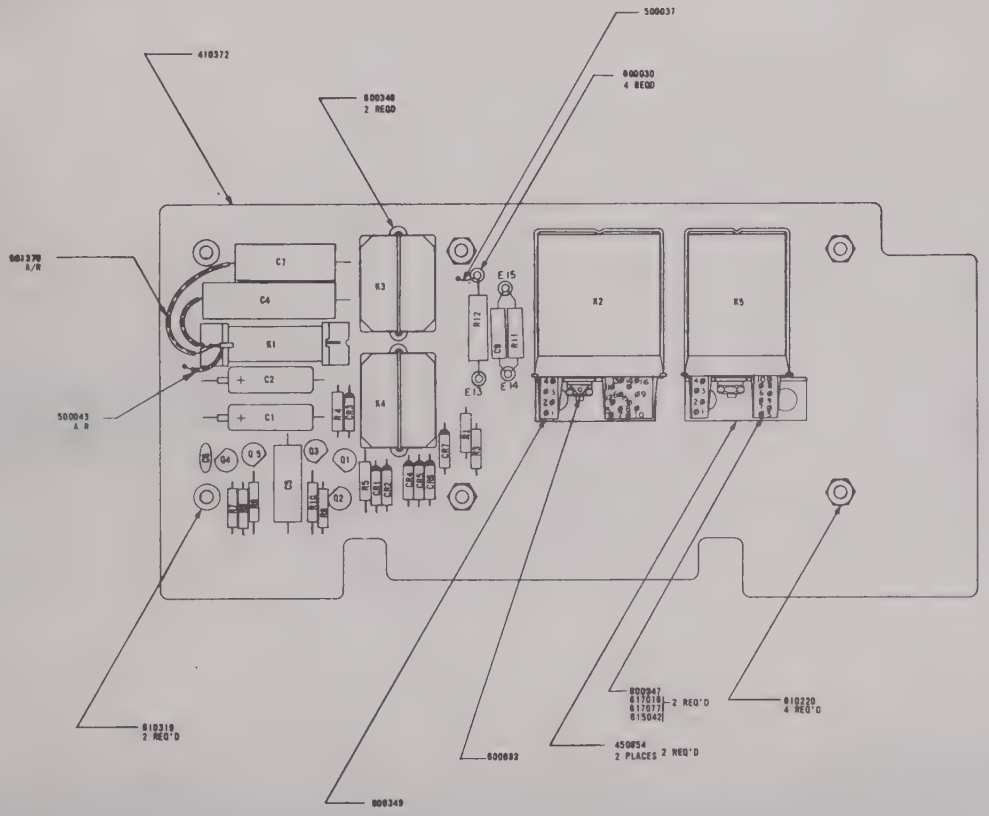
DRAWN J. McCONAGHY 7-27-72
CHECK C. MALONE 9/14/72
DESIGN 9/14/72
PROJ ENGR 9/15/72

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

P C BRD ASSY-ATTEN, FILTER AND ATTENUATOR

SIZE	CODE IDENT NO.	DWG NO.	REV
D	21793	402441	B

SCALE 2/1 WT ——— SHEET 1 OF 1



REF DES OR ITEM	P/N	DESCRIPTION	QTY
C1	110043	25UF/25V	2
C2	110043	25UF/25V	REF
C4	120116	.056UF/200V	1
C5	120124	.056UF/50V	1
C6	101182	47PF DISC	1
C7	120125	.027UF/200V	1
C8	121146	.0047UF/100V	1
CR1	211083	Q18	6
CR2	211083	Q18	REF
CR3	220004	1N961B	1
CR4	211083	Q18	REF
CR5	↓	↓	
CR6			
CR7	211083	Q18	REF
K1	310013	RELAY	1
K2	310030	RELAY	1
K3	310029	RELAY	3
K4	310089	RELAY	REF
K5	310029	RELAY	REF
Q1	200022	Q12	1
Q2	208104	MPS6571	2
Q3	200404	MPS6571	REF
Q4	208043	2N3565	2
Q5	200043	2N3565	REF

REF DES OR ITEM	P/N	DESCRIPTION	QTY
R1	000101	100	1
R3	000362	3.6K	1
R4	000102	1K	1
R5	010333	464K 1%	3
R6	000514	510K	1
R7	000205	2 MEG	1
R8	000912	9.1K	1
R9	010333	464K 1%	REF
R10	010373	464K 1%	REF
R11	010208	162K 1%	1
R12	010329	887K 1%	1
	A10372	PCB FILTER	1
	420371	ARTWORK FILTER	REF
	45085A	BRACKET RELAY	2
	500037	WIRE-BUSS 34 GA	A/R
	500043	WIRE-24 GAGE TEF	A/R
	501376	TUBING-20 GAGE TEFLON	A/R
	600030	TERMINAL-TEFLON	4
	600032	LUG-SOLDER	1
	600347	SOCKET RELAY 2 POLE SOLDER TERM	1
	600348	SOCKET RELAY 2 POLE SOLDER TERM	2

REF DES OR ITEM	P/N	DESCRIPTION	QTY
	640249	SOCKET RELAY 8 POLE SOLDER TERM.	1
	610819	RIVET-1/8 HDW TUBE X 5/32 LG	4
	610220	STDOFF-SWS 4-40 X 1 LG	4
	610539	STDOFF-SWS 4-40 1/4DIA X 11/16 LG	2
	615042	SCREW PPH 4-40 X 1/4	2
	617016	HEX NUT 4-40 BRS	4
	617077	WASHER INT TOOTH #4	4
	920010	SOLDER BAR	A/R
	920026	SOLDER WIRE	A/R

1. ALL RESISTORS TO BE 1/4W ± 5%, CARBON
2. ALL DIODES TO BE 018.
3. SCHEMATIC REFERENCE. 430838
4. ASSEMBLY PROCEDURES AND PROCESSES TO COMPLY WITH DANA STANDARDS (IF STANDARD)
5. ALL RESISTOR VALUES ARE IN OHMS

NOTE: UNLESS OTHERWISE SPECIFIED

NEXT ASSY	USED ON	NA	FA
402443	5500-112	1	1
APPLICATION		QTY REQD	

QTY REQD	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION OR VENDOR P/N	ITEM NO.

LIST OF MATERIAL OR PARTS LIST

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON: DECIMALS .X ±.030 .XX ±.010 .XXX ±.005 | ANGLES 0° 30' | FORMED ANGLES 1.0
MATERIAL
FINISH

CONTRACT NO.

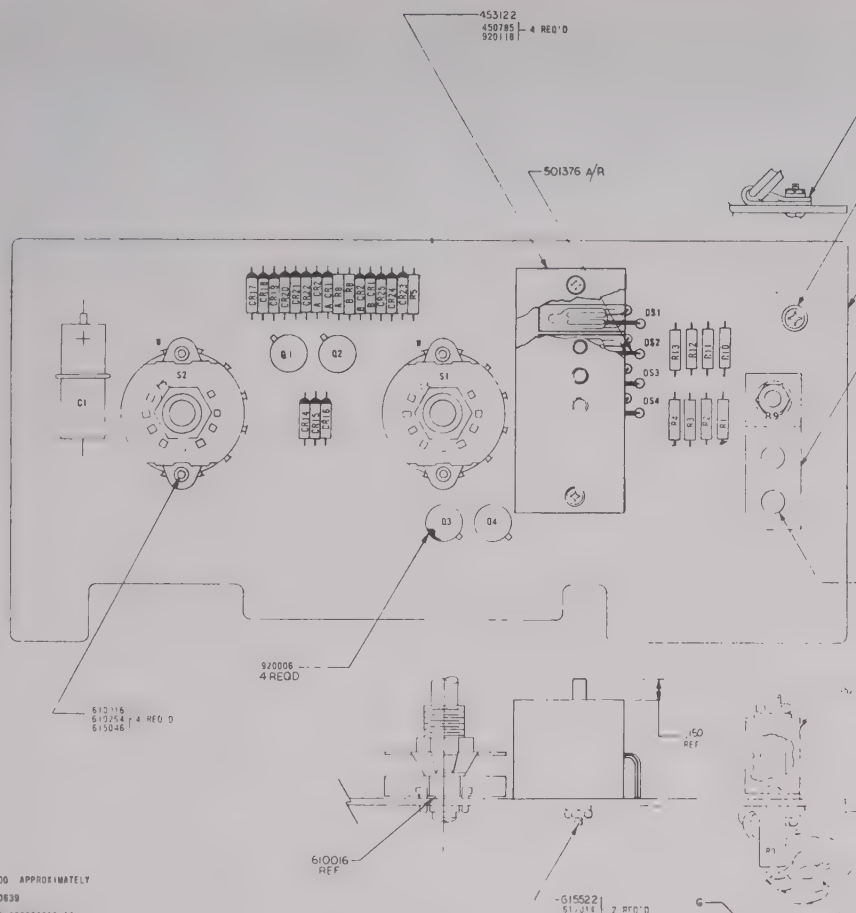
DRAWN 7-18-67
CHECK 7/18/67
DESIGN 7/19/67
PROJ ENGR 7/19/67

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

P C BRD ASS'Y-FILTER, FILTER ATTENUATOR

SIZE D | CODE IDENT NO. 21793 | DWG NO. 402442 | REV E

SCALE 2/1 | WT | SHEET 1 OF 2



REF DES OR ITEM	P/N	DESCRIPTION	QTY
R10	000814	810R	4
R11			
R12			
R13	000814	910R	REF

REF DES OR ITEM	P/N	DESCRIPTION	QTY
C1	110044	CAP-50 MFD/50V	1
CR14	211083	DIODE-TYPE 018	16
CR15	211083	DIODE-TYPE 018	REF
CR16			
CR17			
CR18			
CR19			
CR20			
CR21			
CR22			
CR23			
CR24			
CR25	211083	DIODE-TYPE 018	REF
DS1	920116	LAMP NEON #NE2H	4
DS2	920116	LAMP NEON #NE2H	REF
DS3	920116	LAMP NEON #NE2H	REF
DS4	920116	LAMP NEON #NE2H	REF
Q1	200035	TRANS 014 NPN S1	2
Q2	200035	TRANS 014 NPN S1	REF
Q3	200079	TRANS 021	2
Q4	200079	TRANS 021	REF
R1	000473	47K 1/4W	4
R2	000473	47K 1/4W	REF
R3	000473	47K 1/4W	REF
R4	000473	47K 1/4W	REF
R5	000151	150 OHM 1/4W	1
R8	000243	24K 1/4W	2
R9	040089	POT CERMET 200K TRIMPOT	1
S1	600321	SWITCH-ROT. 1 POL. 7 POS. RNG & FUN.	2
S2	600321	SWITCH ROT. 1 POL. 7 POS. RNG & FUN	REF
	410373	PCB FUNCTION CONT. 112	1

REF DES OR ITEM	P/N	DESCRIPTION	QTY
	420372	ARITHMETIC FUNCTION CONTROL 112	A/R
	430639	SCHEM FUNCTION CONTROL 112	A/R
	450785	TUBE-INDICATOR	4
	453122	LIGHT BLOCK	1
	452389	CABLE MOLDED HOOD	1
	452464	BRKT POT MTG	1
	500002	TUBING SHRINK .153 I.D.	A/R
	501376	TEFLON TUBING	A/R
	524000	WIRE 24 GA STR O COLOR	A/R
	610016	WASHER FIBER 4 HH SMITH 2164 BLK	4
	610019	RIVET 1/8 SEMI-TUB X 5/32 LG	2
	610179	CLAMP CABLE	1
	610264	WASHER INSUL .25 X .12 X .020 THK	4
	615046	SCREW PPH 4-40 X 1/2 STLS	4
	615057	SCREW PPH 6-32 X 1/4 STLS	1
	615522	SCREW PFH 2-56 X 1.125 STLS	2
		X 7/8 STLS	
	617005	HEX NUT 6-32 STD STLS	1
	617014	HEX NUT 2-56 RADIO STLS	2
	617075	WASHER INT LOCK 2 STLS	2
	617103	WASHER FLAT LSER 6 STLS	1
	920006	TRANS PAD-LARGE	4
	920010	SOLDER-63/37 BAR	A/R

⚠ CABLE LENGTH TO BE 8.000 APPROXIMATELY

4 SCHEMATIC REFERENCE 430639

3 ASSEMBLY PROCEDURES AND PROCESSES TO CONFORM WITH DANA WORKMANSHIP STANDARDS

2. ALL DIODES TO BE 018

1. ALL RESISTORS TO BE 1 4W ± 5% CARBON

NOTE: UNLESS OTHERWISE SPECIFIED

QTY REQD	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION OR VENDOR P'N	ITEM NO.

LIST OF MATERIAL OR PARTS LIST

4C2447	5500-112	1	1
NEXT ASSY	USED ON	NA	FA
APPLICATION		QTY REQD	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON DECIMALS ANGLES FORMED .XX ±.010 0° 30' ANGLES ±1.0

MATERIAL

FINISH

CONTRACT NO

DRAWN

CHECK

DESIGN

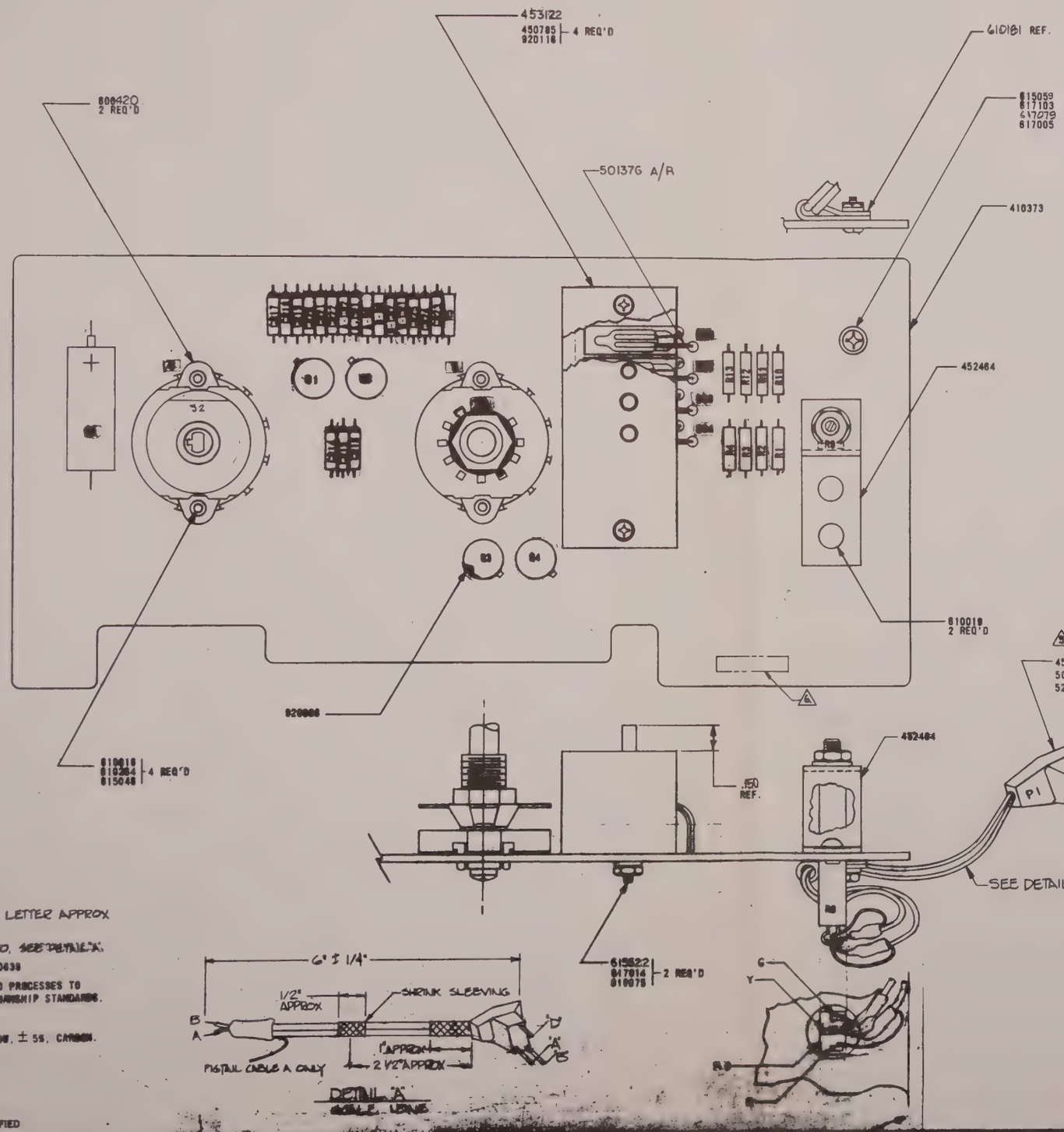
PROJ ENGR

DANA LABORATORIES INC.
IRVINE CALIFORNIA

P C BOARD — FUNCTION CONTROL

SIZE	CODE IDENT NO	DWG NO.	REV
D	21793	402444	F

SCALE 2/1 WT SHEET 1 OF 2



P/N	DESCRIPTION	QTY
410373	PCB FUNCTION CONT	1
420272	ARTWORK FUNCTION CONTROL	A/R
430639	SCHEM FUNCTION CONTROL	A/R
450785	TUBE INDICATOR	4
453122	LIGHT BLOCK	1
452399	CABLE MOLDED HOOD	1
452464	BRKT POT MTG	1
500002	TUBING SHRINK .153 I.D.	A/R
501376	TEFLON TUBING	A/R
524000	WIRE 24 GA STR O COLOR	A/R
610016	WASHER FIBER 4HH SMITH 2164 BLK	4
610019	RIVET 1/8 SEMI-TUB X 5/32 LG	2
610264	WASHER INSUL .25 X .12 X .020 THK	4
615046	SCREW PPH 4-40 X 1/2 STLS	4
615059	SCREW PPH 6-32 X 5/8 STLS	1
615522	SCREW PFH 2-56 X .875 STLS	1
617005	HEX NUT 6-32 STD STLS	1
617014	HEX NUT 2-56 RADIO STLS	2
617075	WASHER INT LOCK 2 STLS	2
617079	LOCK WASHER	
617103	WASHER FLAT LSER 6 STLS	1
920006	TRANS PAD-LARGE	4
920010	SOLDER 63/37 BAR	A/R
610179	CLAMP CABLE	1

REF DES	PART NO.	DESCRIPTION	QTY
R8	000243	24k	2
R5	000151	150	1
R4	000473	47k	4
R3	000473	47k	REF
R2	000473	47k	REF
R1	000473	47k	REF
Q4	200079	021	2
Q3	200079	021	REF
Q2	200035	014	2
Q1	200035	014	REF
DS4	920116	LAMP NEON	4
DS3	920116	LAMP NEON	REF
DS2	920116	LAMP NEON	REF
DS1	920116	LAMP NEON	REF
CR25	211083	018	16
CR24	↑	↑	REF
CR23	↑	↑	↑
CR22	↑	↑	↑
CR21	↑	↑	↑
CR20	↑	↑	↑
CR19	↑	↑	↑
CR18	↑	↑	↑
CR17	↑	↑	↑
CR16	↑	↑	↑
CR15	↓	↓	↓
CR14	211083	018	REF
CR1	211083	018	REF
CR2	211083	018	REF
C1	110044	50UF/50V	1

REF DES	PART NO.	DESCRIPTION	QTY
R13	000914	910k	REF
R12	↑	↑	↑
R11	↑	↑	↑
R10	000914	910k	4
S2	800432	SWITCH	2
S1	800432	SWITCH	REF
R9	040000	200k POT	1

1. ALL RESYSTORS TO BE 1/4W, ± 5%, CARBON.
2. ALL DIODES TO BE .018.
3. ASSEMBLY PROCEDURES AND PROCESSES TO CONFORM WITH DANA WORKMANSHIP STANDARDS.
4. SCHEMATIC REFERENCE: 430639
5. CABLE LENGTH TO BE 6.00, SEE DETAIL "A".
6. MARK ASSY NO. & REV LETTER APPROX WHERE SHOWN

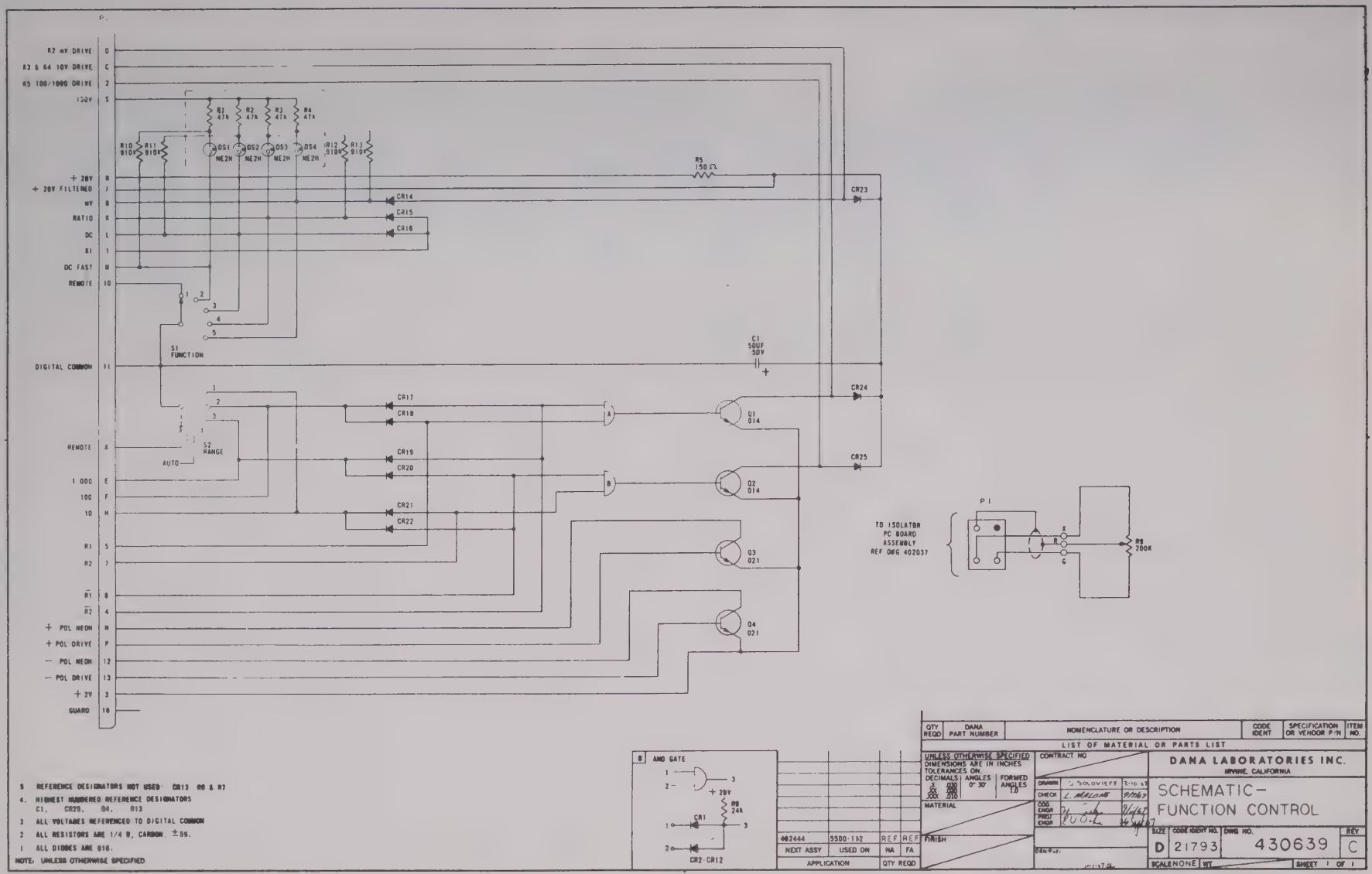
NOTE: UNLESS OTHERWISE SPECIFIED

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

P C BOARD — FUNCTION CONTROL

SIZE	CODE IDENT NO.	DWG NO.	
D	21793	402997	E

SCALE 2/1 WT SHEET 1



8 REFERENCE DESIGNATORS NOT USED: CR13 R0 & R7

4. HIGHEST NUMBERED REFERENCE DESIGNATORS C1, CR25, Q4, R13

3 ALL VOLTAGES REFERENCED TO DIGITAL COMMON

2 ALL RESISTORS ARE 1/4 W, CARBON, ±5%.

1 ALL DIODES ARE 818.

NOTE: UNLESS OTHERWISE SPECIFIED

QTY REQD	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION OR VENDOR P/N	ITEM NO.

LIST OF MATERIAL OR PARTS LIST

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON: DECIMALS: X ±.020, XX ±.010, XXX ±.005; ANGLES 0° 30'; FORMED ANGLES 1.0

MATERIAL

FINISH

402444	5500-132	REF	REF
NEXT ASSY	USED ON	MA	FA
APPLICATION		QTY REQD	

CONTRACT NO

DRAWN: J. SOLOVIEFF 3-10-67

CHECK: L. MALONE 3/10/67

ODD ENGR

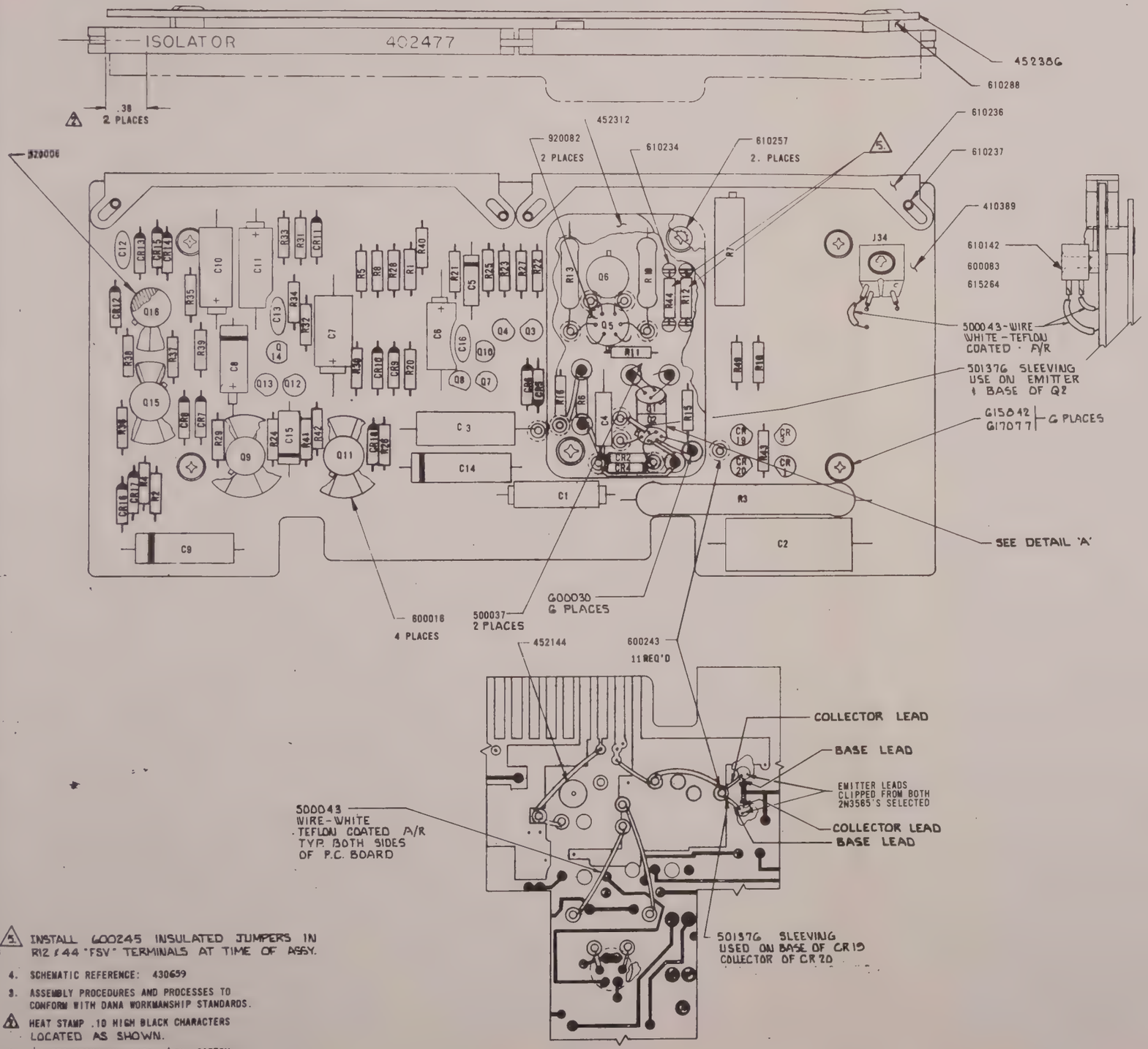
PROJ ENGR: P. Lohr 3/16/67

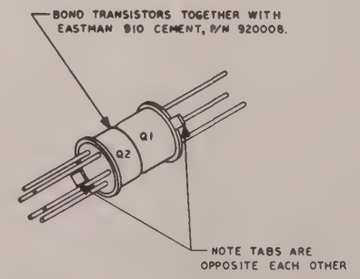
DANA LABORATORIES INC.
IRVINE, CALIFORNIA

SCHEMATIC—
FUNCTION CONTROL

SIZE	CODE IDENT NO.	DWG NO.	REV
D	21793	430639	C

SCALE NONE WT SHEET 1 OF 1





DETAIL "A"
SCALE : NONE

5. INSTALL 600245 INSULATED JUMPERS IN R12 & 44 "FSV" TERMINALS AT TIME OF ASSY.

4. SCHEMATIC REFERENCE: 430659

3. ASSEMBLY PROCEDURES AND PROCESSES TO CONFORM WITH DANA WORKMANSHIP STANDARDS.

2. HEAT STAMP .10 HIGH BLACK CHARACTERS LOCATED AS SHOWN.

1. ALL RESISTORS ARE 1/4W, ±5%, CARBON.

NOTE: UNLESS OTHERWISE SPECIFIED

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

PCB ASSY.—
ISOLATOR

SIZE	CODE IDENT NO.	DWG NO.	REV
D	21793	402477	S

SCALE 2/1 | WT | SHEET 1 OF 5

SHEET 2 THRU 5 ARE 'A' SIZE B/M

P16

+28V C
+18V 5
+INPUT U
-INPUT T
-18V D
-SENSE COM 2
ISO OUTPUT J
OUTPUT SENSE F
10K A/D INPUT I
ANALOG COM A
ISOLATOR GUARD V S 18 16
-28V GUARD B E
GUARD

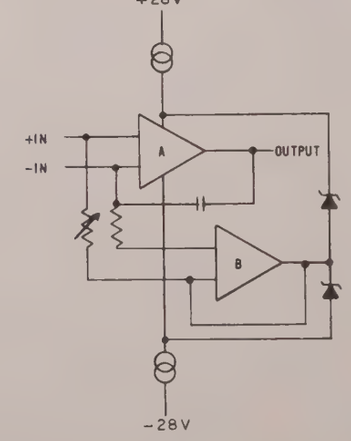
R2 100Ω
J34 D B A
R8 1.5K
R12 FSV
R44 FSV
R5 6.2K
CR1 CR3
R13 10 MEG 1%
R18 10 MEG 1%
CR18 CR20
R1 1.5K
C1 .0056UF 125V
R3 25M 2%
CR2 007
CR4 007
Q2 7
C4 .0047UF 100V
R6 2.4K
R15 6.8M
C3 2UF 100V
R43 10k
C2 1UF 300V
R10 7.5K
R16 1.3K
R11 13M
R7 10K
R49 75Ω
Q1 2N1304
CR5 CR6
R21 5.8M
Q7
Q4 200043
Q6 200043
R20 3.3M
R4 100Ω

R23 9.1K
R25 1K
R27 1K
C5 .001UF 100V
Q10 Q12
R28 4.7K
Q5 8
Q6 8
C14 .1UF 100V
R40 43K
R22 39K
R30 9.1K
C8 .5UF 50V
R32 9.1K
Q14 Q12
R34 3.3K
C13 100 PF
C9 .1UF 100V
CR14 CR15
R35 510Ω

R31 1K
R33 3.3K
CR11
R36 15K
HEATSINK Q15 Q14
CR12 CR13
R37 24Ω
R38 75Ω
C12 15PF
HEATSINK Q16 Q14
R39 24Ω
CR16 SD4
CR17 SD4

CR18 1/4W 2.4 AZ10
R26 1.2K
C15 .01UF 100V
R41 100Ω
HEATSINK Q11 009
R42 15K
C14 100PF
Q8 SE4020
CR9 1N958B
C6 50UF 12V
R24 51K
CR10 1N958B
C7 50UF 12V
C10 25UF 50V
HEATSINK Q9 Q14
C11 25UF 50V
CR7 CR8
R29 100Ω

ISOLATOR BLOCK DIAGRAM



5. HIGHEST NUMBERED REFERENCE DESIGNATORS USED: C15 CR20, Q16, R49
4. ALL VOLTAGES REFERENCED TO ANALOG COMMON.
3. ALL TRANSISTORS 2N3585.
2. ALL RESISTORS 1/4W, ± 5%, CARBON.
1. ALL DIODES 016.

⚠8 Q5 & Q6 ARE SELECTED Q16, P/N 200083.
⚠7 Q2 IS SELECTED Q15, DANA P/N 200827.
⚠6 CR1, CR3, CR18 & CR20 ARE DANA P/N 200048 SELECTED 2N3585.

NOTES: UNLESS OTHERWISE SPECIFIED

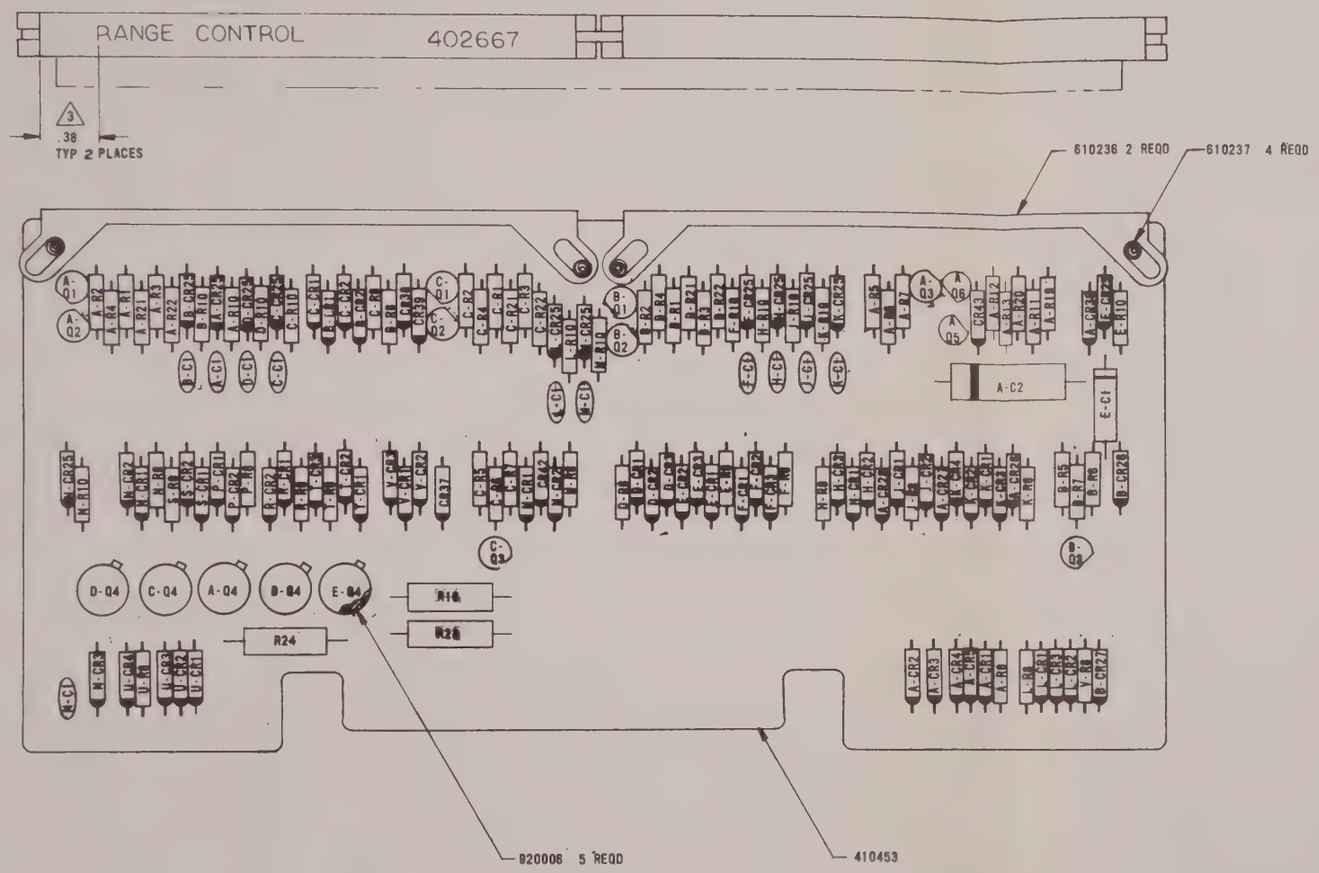
DANA LABORATORIES INC.
IRVINE, CALIFORNIA

SCHEMATIC - ISOLATOR

SIZE	CODE IDENT NO.	DWG NO.	REV
D	21793	430659	F

SCALE NONE | WT — | SHEET 1 OF 1

9-28-67



REF DES OR ITEM	P N	DESCRIPTION	QTY
C1	101174	.001UF DISC	11
E-C1	121092	.0022UF/100	1
A-C2	121093	.047UF/100V	1
CR1	211083	018	63
A-CR1	210034	SD4	
CR2	211083	018	REF
A-CR2	210004	SD4	REF
J-CR2	210004	SD4	REF
K-CR2	210004	SD4	REF
M-CR2	210004	SD4	REF
CR3	211083	018	REF
A-CR3	210004	SD4	REF
L-CR3	210004	SD4	REF
U-CR3	210004	SD4	REF
CR4	211083	018	REF
A-CR4	210004	SD4	REF
CR5	210004	SD4	REF
CR25	211083	018	REF
CR26	211083	018	REF
CR27	211083	018	REF
CR28	211083	018	REF
CR36	211083	018	REF
CR37	210004	SD4	REF
CR38	210004	SD4	REF
CR39	211083	018	REF
CR42	211083	018	REF
CR43	220004	1N961B ZEN	1

REF DES OR ITEM	P N	DESCRIPTION	QTY
Q1	200043	2N3565	10
Q2	200043	2N3565	REF
Q3	200043	2N3565	REF
Q4	200078	021	5
Q5	200043	2N3565	REF
Q6	200037	2N3646	1
R1	000222	2.2k	6
R2	000153	15k	9
R3	000222	2.2k	REF
R4	000153	15k	REF
R5	000822	8.2k	1
R6	000153	15k	REF
R7	000204	200k	3
R8	000243	24k	
B-R8	000123	12k	2
C-R8	000123	12k	REF
D-R8	000512	5.1k	8
E-R8	000512	5.1k	REF
H-R8	000822	8.2k	REF
J-R8	000822	8.2k	REF
K-R8	000822	8.2k	REF
L-R8	000822	8.2k	REF
M-R8	000822	8.2k	REF
T-R8	000682	6.8k	1
V-R8	000822	8.2k	REF
R10	000273	27k	12
R11	000243	24k	REF
R12	000822	8.2k	REF

REF DES OR ITEM	P/N	DESCRIPTION	QTY
R13	000202	2k	1
R18	030013	200k 1W	2
R19	000104	100k	2
R20	000104	100k	REF
R21	000512	5.1k	REF
R22	000512	5.1k	REF
R23	030013	200k 1W	REF
R24	030012	130k 1W	1
	410453	PCB-RANGE CONTROL	1
	430758	SCHEM-RANGE CONT	A/R
	610236	HANDLE-EXTRACTOR	2
	610237	PIN-SPRING	4
	920006	TRANS PAD-LARGE	5
	920018	SOLDER-BAR	A/R

4. SCHEMATIC REFERENCE: 430758
3. HEAT STAMP .18 HIGH BLACK CHARACTERS LOCATED AS SHOWN.
2. ASSEMBLY PROCEDURES AND PROCESSES TO CONFORM WITH DANA WORKMANSHIP STANDARDS.
1. ALL RESISTORS ARE 1/4 W, ± 5%, CARBON.

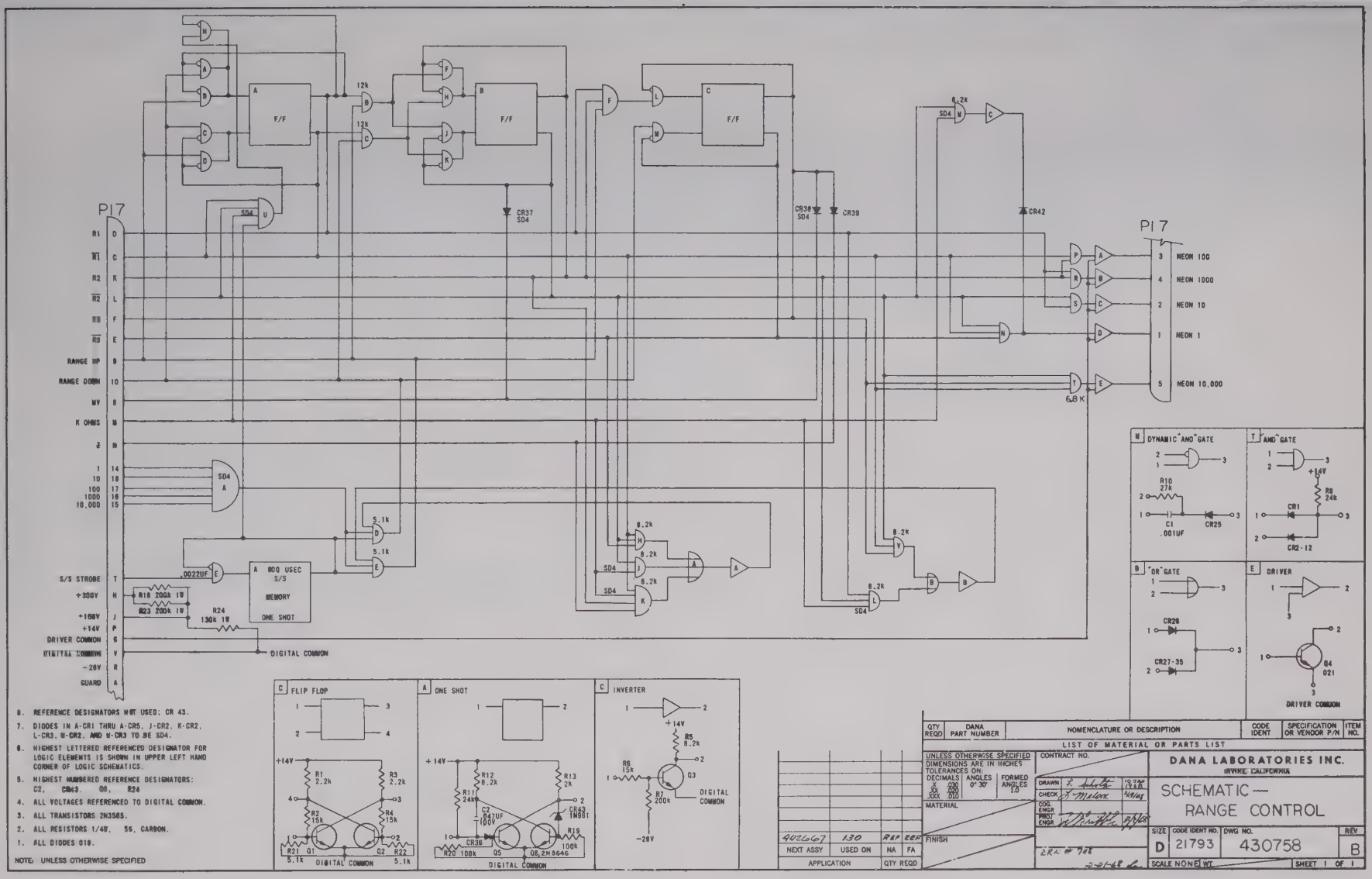
NOTE: UNLESS OTHERWISE SPECIFIED

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

PC BOARD ASSY-
RANGE CONTROL

SIZE	CODE IDENT NO.	DWG NO.	REV
D	21793	402667	E

SCALE 2/1 | WT | SHEET 1 OF 1



8. REFERENCE DESIGNATORS NOT USED: CR 43.
7. DIODES IN A-CR1 THRU A-CR5, J-CR2, K-CR2, L-CR3, W-CR2, AND V-CR3 TO BE SD4.
6. HIGHEST LETTERED REFERENCED DESIGNATOR FOR LOGIC ELEMENTS IS SHOWN IN UPPER LEFT HAND CORNER OF LOGIC SCHEMATICS.
5. HIGHEST NUMBERED REFERENCE DESIGNATORS: C2, CR43, Q6, R24
4. ALL VOLTAGES REFERENCED TO DIGITAL COMMON.
3. ALL TRANSISTORS 2N3585.
2. ALL RESISTORS 1/4W, 5% CARBON.
1. ALL DIODES 018.

NOTE: UNLESS OTHERWISE SPECIFIED

QTY REQD	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION OR VENDOR P/N	ITEM NO.

LIST OF MATERIAL OR PARTS LIST

4026667	130	REQ	REQ
NEXT ASSY	USED ON	NA	FA
APPLICATION		QTY REQD	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON: DECIMALS X .030 XX .020 XXX .010 ANGLES 0° 30' FORMED ANGLES 1.0
MATERIAL
FINISH
CONTRACT NO.

DRAWN R. Schulte 10-24-67
CHECK J. Melvin 10/28/67
COG. ENGR
PROJ. ENGR W. Bruce 10/28/67
ERA # 928 2-21-68

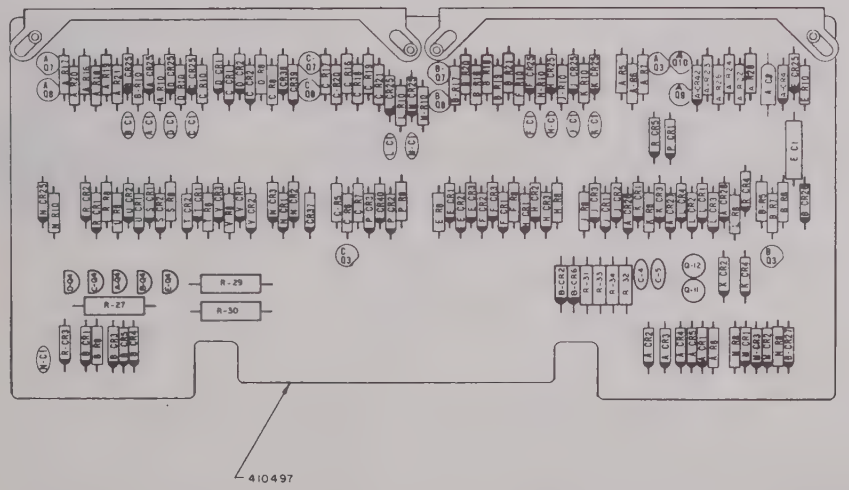
DANA LABORATORIES INC.
IRVINE CALIFORNIA

SCHEMATIC — RANGE CONTROL

SIZE	CODE IDENT NO.	DWG NO.	REV
D	21793	430758	B

SCALE NONE WT. SHEET 1 OF 1

RANGE CONTROL 403114



1 FOR SCHEMATIC SEE DRAWING 430844.

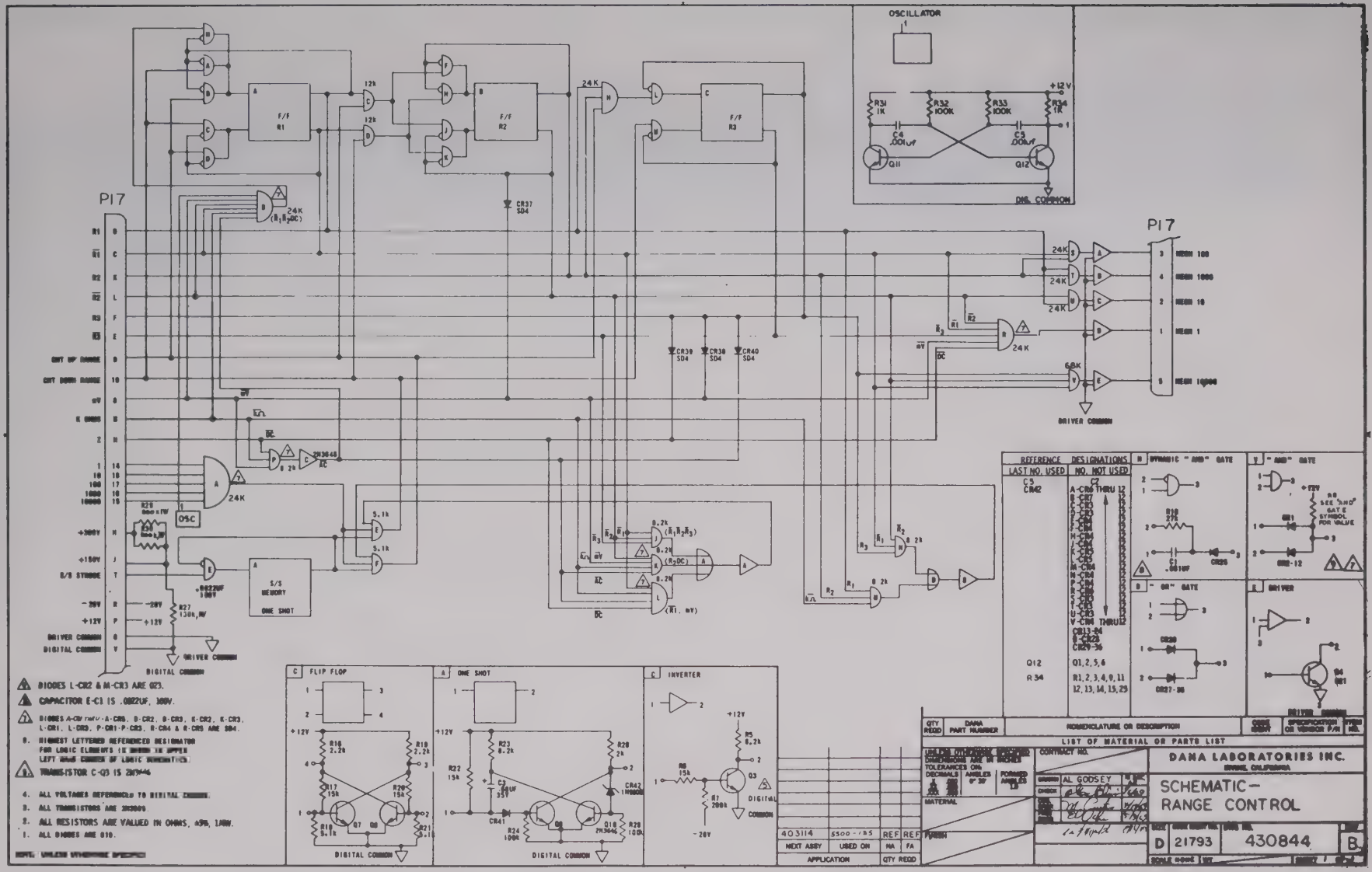
NOTE UNLESS OTHERWISE SPECIFIED

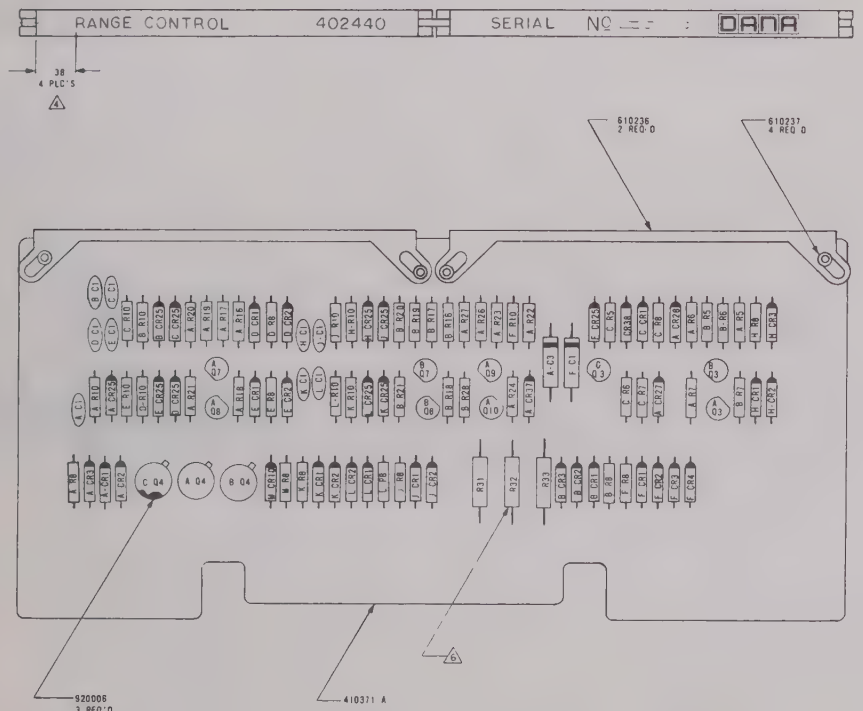
DANA LABORATORIES INC.
IRVINE, CALIFORNIA

PC BOARD ASSY-
RANGE CONTROL

SIZE	CODE IDENT NO	DWG NO.	REV
D	21793	403114	E

SCALE 2/1 | SHEET 2 OF 2


OSCILLATOR
+12V
R31 1K
R32 100K
R33 100K
R34 1K
C4 .001uf
C5 .001uf
Q11
Q12
DIG. COMMON
P17
F/F R1
F/F R2
F/F R3
CR37 SD4
CR39 SD4
CR38 SD4
CR40 SD4
24K
12k
5.1k
6.8K
OSC
S/S MEMORY
ONE SHOT
+300V
+150V
S/S STROBE
-28V
+12V
DRIVER COMMON
DIGITAL COMMON
DRIVER COMMON
REFERENCE DESIGNATIONS
LAST NO. USED
NO. NOT USED
C5
CR42
C7
A-CR6 THRU 12
B-CR7
C-CR8
D-CR9
E-CR10
F-CR11
H-CR4
J-CR5
K-CR2
L-CR1
M-CR3
N-CR4
P-CR5
R-CR6
S-CR7
T-CR8
U-CR9
V-CR6 THRU 12
CR13-24
B-CR28
CR29-36
Q12
Q1,2,5,6
R34
R1,2,3,4,9,11
12,13,14,15,25
N "DYNAMIC" AND" GATE
V "AND" GATE
D "OR" GATE
E DRIVER
C FLIP FLOP
A ONE SHOT
C INVERTER
DIGITAL COMMON
1. ALL DIODES ARE 910.
2. ALL RESISTORS ARE VALUED IN OHMS, ±5%, 1/4W.
3. ALL TRANSISTORS ARE 2N3906.
4. ALL VOLTAGES REFERENCED TO DIGITAL COMMON.
DIODES L-CR2 & M-CR3 ARE 923.
CAPACITOR E-C1 IS .0022UF, 100V.
DIODES A-CR6 THRU A-CR6, B-CR2, B-CR3, K-CR2, K-CR3, L-CR1, L-CR3, P-CR1-P-CR3, R-CR4 & R-CR5 ARE 504.
TRANSISTOR C-Q3 IS 2N3646
QTY REQD
DANA PART NUMBER
NOMENCLATURE OR DESCRIPTION
CODE IDENT
SPECIFICATION OR VENDOR P/N
ITEM NO.
LIST OF MATERIAL OR PARTS LIST
CONTRACT NO.
DANA LABORATORIES INC.
IRVINE, CALIFORNIA
AL GODSEY
SCHEMATIC—
RANGE CONTROL
SIZE
D
DRAWING NO.
21793
REV. NO.
430844
B
403114
5500-785
REF
REF
NEXT ASSY
USED ON
NA
FA
APPLICATION
QTY REQD



Q9	200043	2N3565			
Q8	200043	2N3565			
Q7	200043	2N3565			
			R33	030012	130k 1W
Q4	200079	Q21	R32	030013	200k 1W
Q3	200043	2N3565	R31	030013	200k 1W
CR38	211083	D18	R28	000512	5.1k
			R27	000153	15k
CR37	211083	D18	R26	000822	8.2k
			P24	000104	100k
CR28	211083	D18	R23	000822	8.2k
CR27	211083	D18	R22	000243	24k
			R21	000512	5.1k
CR25	211083	D18	R20	000153	15k
			R19	000222	2.2k
			R18	000512	5.1k
B CR3	416004	SD4	R17	000153	15k
B CR2	210004	SD4	R16	000222	2.2k
B CR1	210004	SD4	R10	000273	27k
			J R8	000822	8.2k
CR4	211083	D18	H R8	000512	5.1k
CR3	211083	D18	F R8	000512	5.1k
CR2	211083	D18	C R8	000822	8.2k
CR1	211083	D18	R8	000243	24k
			R7	000204	200k
			R6	000153	15k
			R5	000822	8.2k
C3	121092	.0022UF 100V			
F C1	121092	.0022UF 100V			
C1	101174	.001UF DISC			
REF DES	PART NO.	DESCRIPTION	Q10	2.0C37	2N3646

⚠ ALL 1 WATT RESISTORS TO BE EXTENDED 1/8 INCH ABOVE P.C BOARD

5 SCHEMATIC REFERENCE 430837

⚠ HEAT STAMP 10 HIGH BLACK CHARACTERS AND 15 HIGH LOGO LOCATED AS SHOWN

3 ASSEMBLY PROCEDURES AND PROCESSES TO CONFORM WITH DANA WORKMANSHIP STANDARDS

2. ALL DIODES TO BE D18

1. ALL RESISTORS TO BE 1/4W, ± 5% CARBON

NOTE: UNLESS OTHERWISE SPECIFIED

QTY REQD	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION OR VENDOR P N	ITEM NO.
		LIST OF MATERIAL OR PARTS LIST			

402448	5300-112	1	
NEXT ASSY	USED ON	NA	
APPLICATION		QTY REQD	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON DECIMALS X .XX .XXX .010 ANGLES 0° 30' FORMED ANGLES 1.0

MATERIAL

FINISH

CONTRACT NO.

DRAWN J.GAHEAU 7/96

CHECK 7/96

DESIGN

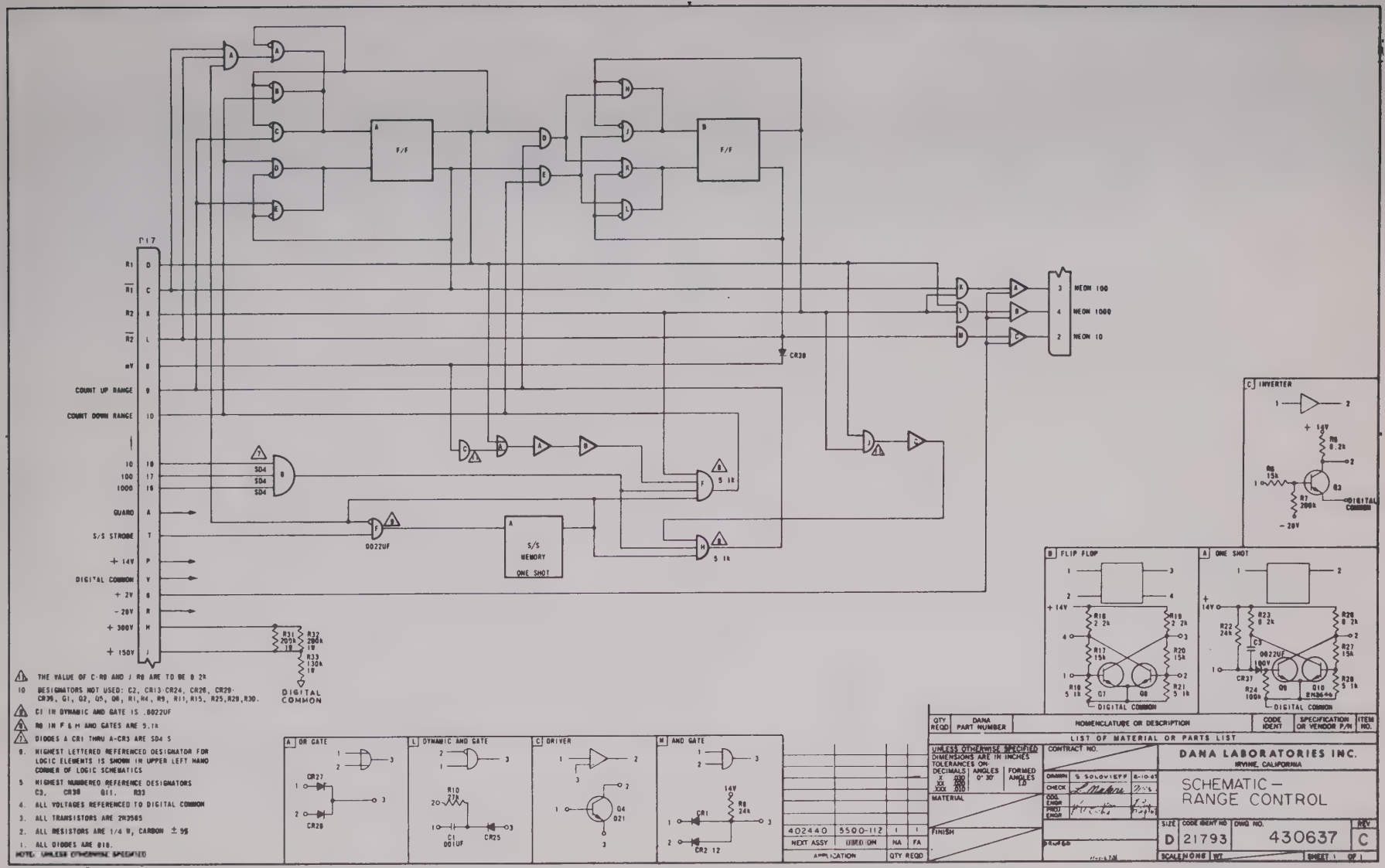
PROJ ENGR 7/96

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

P C BOARD ASS'Y —
RANGE CONTROL

SIZE	CODE IDENT NO	DWG NO	REV
D	21793	402440	C

SCALE 2/1 WT SHEET 1 OF 1



⚠ THE VALUE OF C-R8 AND J R8 ARE TO BE 0.2K

10 DESIGNATORS NOT USED: C2, CR13-CR24, CR26, CR29-CR39, G1, Q2, Q5, Q6, R1, R4, R9, R11, R15, R25, R28, R30.

⚠ C1 IN DYNAMIC AND GATE IS .0022UF

⚠ R8 IN F & H AND GATES ARE 5.1K

⚠ DIODES A CR1 THRU A-CR3 ARE SD4 S

8. HIGHEST LETTERED REFERENCED DESIGNATOR FOR LOGIC ELEMENTS IS SHOWN IN UPPER LEFT HAND CORNER OF LOGIC SCHEMATICS

5 HIGHEST NUMBERED REFERENCE DESIGNATORS C3, CR38 Q11, R33

4. ALL VOLTAGES REFERENCED TO DIGITAL COMMON

3. ALL TRANSISTORS ARE 2N3565

2. ALL RESISTORS ARE 1/4 W, CARBON ± 5%

1. ALL DIODES ARE 818.

NOTE: UNLESS OTHERWISE SPECIFIED

A OR GATE

L DYNAMIC AND GATE

C DRIVER

M AND GATE

402440	5500-112	1	1
NEXT ASSY	USED ON	NA	FA
APPLICATION		QTY REQD	

QTY REQD	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION OR VENDOR P/N	ITEM NO.

LIST OF MATERIAL OR PARTS LIST

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON: DECIMALS X .XX .XXX ANGLES 0° 30' FORMED ANGLES 1.0

MATERIAL

FINISH

CONTRACT NO.

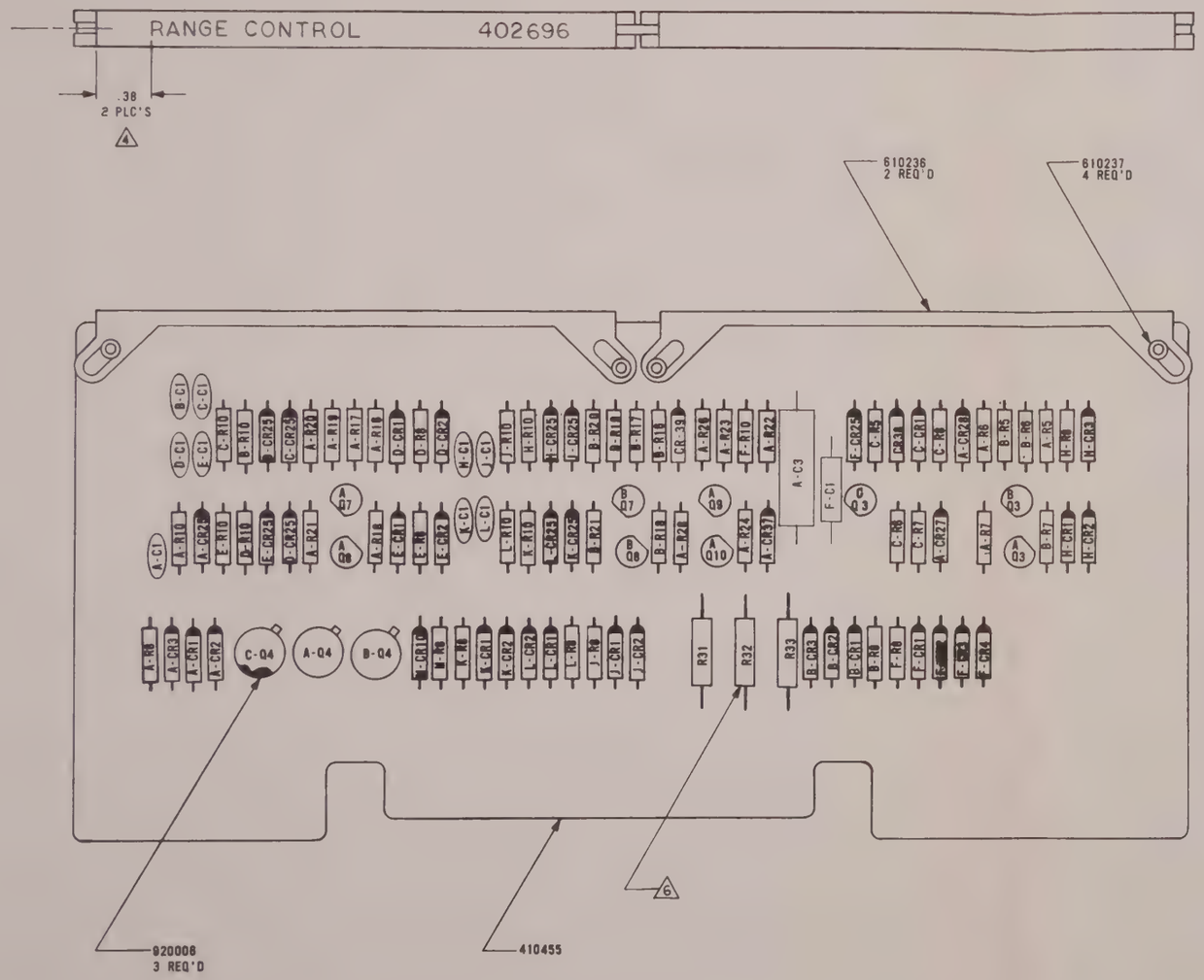
DRAWN	S SOLOVIEFF	8-10-65
CHECK	L Malone	8-16
QUAL ENGR		
PROJ ENGR		

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

SCHEMATIC — RANGE CONTROL

SIZE	CODE IDENT NO	DWG NO.	REV
D	21793	430637	C

SCALE NONE WT SHEET 1 OF 1



P/N	DESCRIPTION	QTY
410455	PCB-RANGE CONTROL	1
430781	SCHEMATIC-RANGE CONTROL	REF
610236	HANDLE-EXTRACTOR	2
610237	PIN-SPRING	4
920008	TRANS PAD-LARGE	3
920010	SOLDER BAR	A R

REF DES	PART NO	DESCRIPTION	
Q9	200043	2N3565	REF
Q8	200043	2N3565	REF
Q7	200043	2N3565	REF
Q4	200078	021	3
Q3	200043	2N3565	8
CR39	220004	1N961B	REF
CR38	211083	018	REF
CR37	211083	018	REF
CR28	211083	018	REF
CR27	211083	018	REF
CR25	211083	018	REF
B-CR3	210004	SD4	REF
B-CR2	210004	SD4	REF
B-CR1	210004	SD4	3
CR4	211083	018	REF
CR3	211083	018	REF
CR2	211083	018	REF
CR1	211083	018	35
C3	121090	.047UF/100V	1
F-C1	121092	.0022UF/100V	1
C1	101174	.001UF DISC	1

REF DES	PART NO	DESCRIPTION	
R33	030012	130k 1W	1
R32	030013	200k 1W	REF
R31	030013	200k 1W	2
R28	000104	100k	REF
R26	000202	2k	1
R24	000104	100k	2
R23	000822	8.2k	REF
R22	000243	24k	REF
R21	000512	5.1k	REF
R20	000153	15k	REF
R19	000222	2.2k	REF
R18	000512	5.1k	REF
R17	000153	15k	REF
R16	000222	2.2k	4
R10	000273	27k	10
J-R8	000022	8.2k	REF
H-R8	000512	5.1k	REF
F-R8	000512	5.1k	6
C-R8	000822	8.2k	REF
R8	000243	24k	8
R7	000204	200k	3
R6	000153	15k	7
R5	000822	8.2k	6
Q10	200037	2N3646	1

6. ALL 1 WATT RESISTORS TO BE EXTENDED 1/8 INCH ABOVE P.C. BOARD
5. SCHEMATIC REFERENCE: 430781
4. HEAT STAMP .10 HIGH BLACK CHARACTERS ——— LOCATED AS SHOWN.
3. ASSEMBLY PROCEDURES AND PROCESSES TO CONFORM WITH DANA WORKMANSHIP STANDARDS.
2. ALL DIODES TO BE 018.
1. ALL RESISTORS TO BE 1/4W, ± 5%, CARBON.

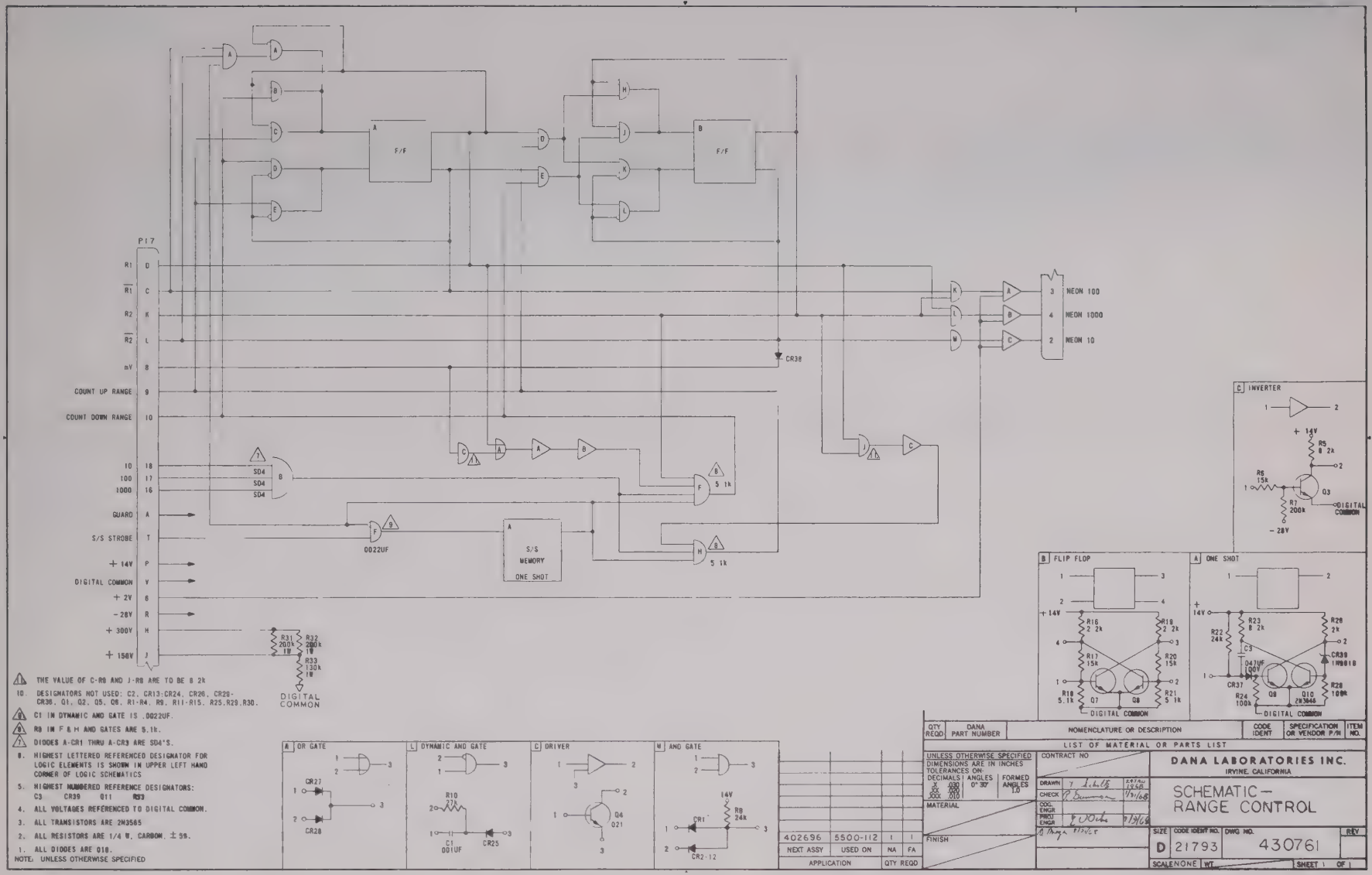
NOTE: UNLESS OTHERWISE SPECIFIED

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

P C BOARD ASS'Y ——
RANGE CONTROL

SIZE	CODE IDENT NO.	DWG NO.	REV
D	21793	402696	C

SCALE 2/1 WT SHEET 1 OF 1



⚠ THE VALUE OF C-R8 AND J-R8 ARE TO BE 8 2k

10. DESIGNATORS NOT USED: C2, CR13,CR24, CR26, CR28-CR36, Q1, Q2, Q5, Q8, R1-R4, R9, R11-R15, R25,R29,R30.

⚠ C1 IN DYNAMIC AND GATE IS .0022UF.

⚠ R8 IN F & H AND GATES ARE 5.1k.

⚠ DIODES A-CR1 THRU A-CR3 ARE SD4'S.

9. HIGHEST LETTERED REFERENCED DESIGNATOR FOR LOGIC ELEMENTS IS SHOWN IN UPPER LEFT HAND CORNER OF LOGIC SCHEMATICS

5. HIGHEST NUMBERED REFERENCE DESIGNATORS: C3 CR39 Q11 R33

4. ALL VOLTAGES REFERENCED TO DIGITAL COMMON.

3. ALL TRANSISTORS ARE 2N3565

2. ALL RESISTORS ARE 1/4 W, CARBON, ± 5%.

1. ALL DIODES ARE Q10.

NOTE: UNLESS OTHERWISE SPECIFIED

QTY REQD	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION OR VENDOR P/N	ITEM NO.
		LIST OF MATERIAL OR PARTS LIST			

402696	5500-112	1	1	
NEXT ASSY	USED ON	NA	FA	
APPLICATION		QTY REQD		

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON: DECIMALS ± ANGLES FORMED ANGLES 1.0

MATERIAL

FINISH

CONTRACT NO

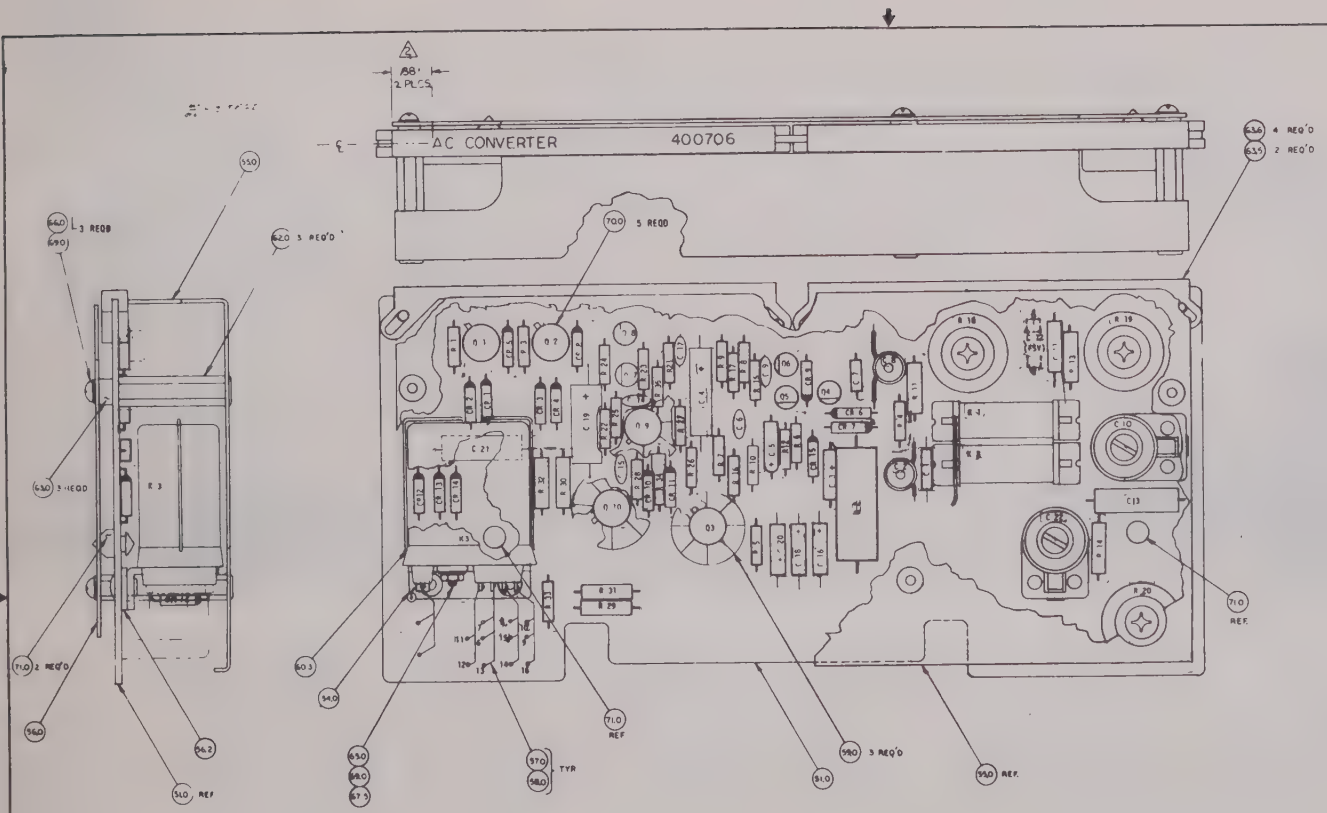
DANA LABORATORIES INC.
IRVINE, CALIFORNIA

DRAWN	J. Childs	2/27/68
CHECK	R. Summers	3/1/68
COG. ENGR		
PROJ ENGR	R. Woods	3/13/68
	R. Mayo	3/14/68

SCHEMATIC — RANGE CONTROL

SIZE	CODE IDENT NO.	DWG NO.	REV
D	21793	430761	

SCALE NONE WT SHEET 1 OF 1



QTY REQD	SYM	ITEM NO.	GOV'T OR VENDOR NO.	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION

LIST OF MATERIAL OR PARTS LIST

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

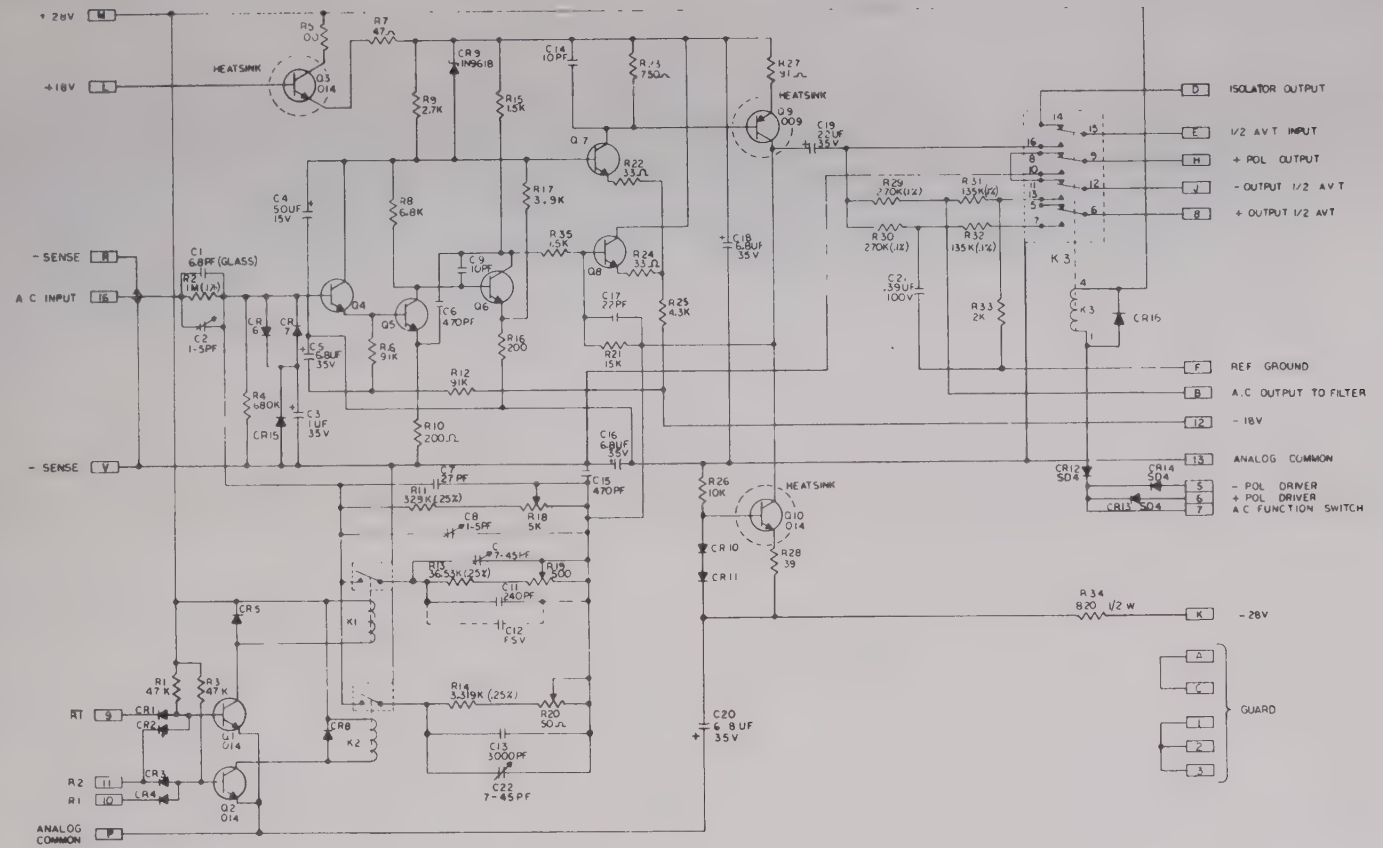
P C BOARD ASS'Y-
AC CONVERTER

SIZE	CODE IDENT NO.	DWG NO.	
D	21733	400706	N

SCALE 2/1 | WT — | SHEET 1 OF 4

4. SCHEMATIC REFERENCE. 430300
3. ASSEMBLY PROCEDURES AND PROCESSES TO CONFORM WITH DANA WORKMANSHIP STANDARDS
2. HEAT STAMP .10 HIGH BLACK CHARACTERS LOCATED AS SHOWN
1. ALL RESISTORS ARE 1/4 W, ± 5%, CARBON.

NOTES: UNLESS OTHERWISE SPECIFIED



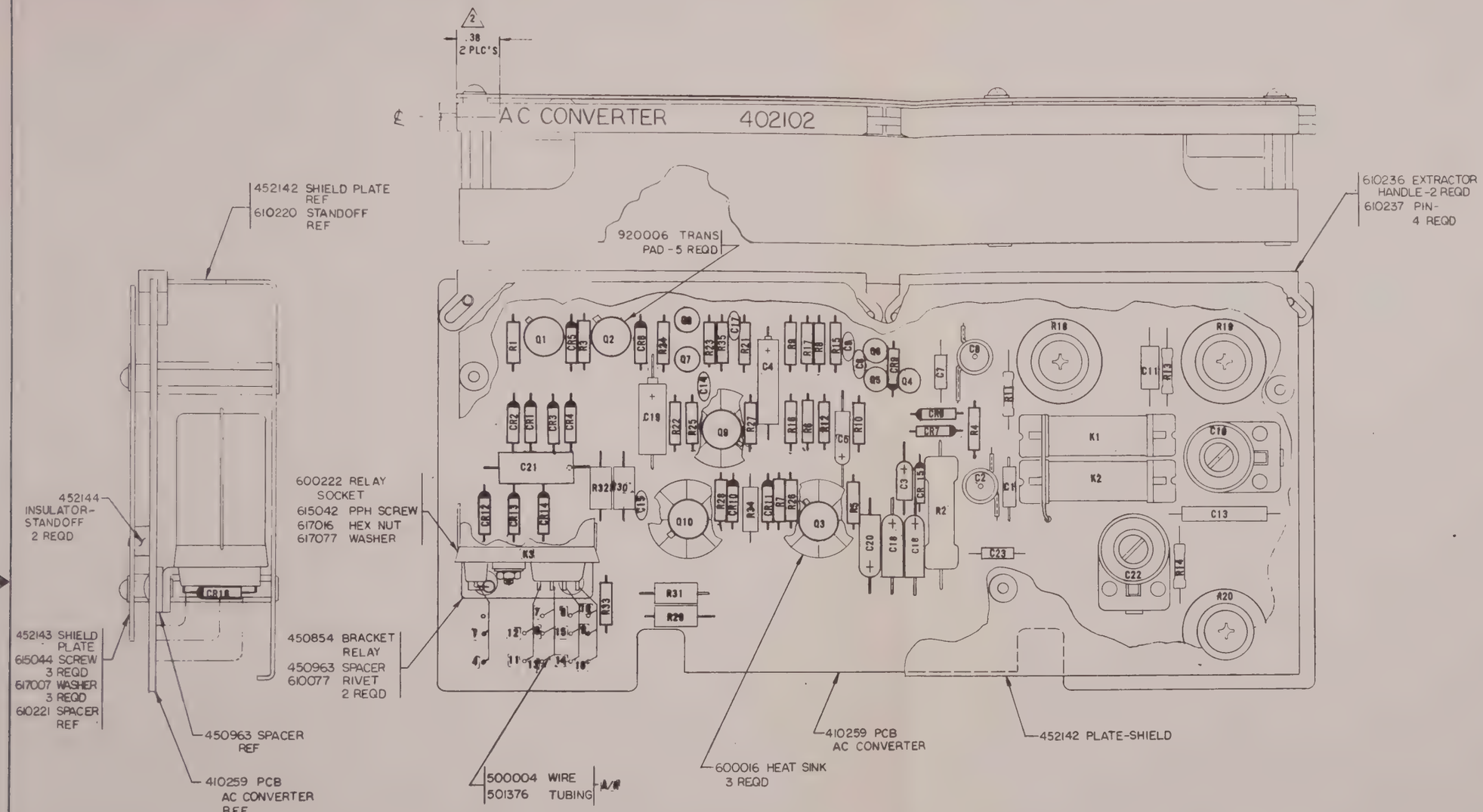
QTY REQD	SYM	ITEM NO	GOVT OR VENDOR NO	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION

LIST OF MATERIAL OR PARTS LIST

MATERIAL	UNLESS OTHERWISE SPECIFIED	CONTRACT NO	DANA LABORATORIES INC. IRVINE, CALIFORNIA
APPLIED FINISH	DIMENSIONS ARE IN INCHES TOLERANCES ON DECIMALS: X ± .030, XX ± .020, XXX ± .010 ANGLES: ± 0° 30' FORMED ANGLES ± 1.0° ECCENTRICITY BETWEEN DIA ON THE SAME AXIS SHALL NOT EXCEED .010 TIR	NAME / DATE DR 9-21-6 CHK APPD	SCHEMATIC — A.C. CONVERTER
HEAT TREATMENT	INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS MIL D 1000 AND MIL D 70327		SIZE D · CODE IDENT NO. 21793 · DWG NO. 430306 · D SCALE NONE · WT · SHEET 1 OF 1

5. Highest numbered reference designators:
   R 34 · D10
   C 21 · C 21d
4. All voltages referenced to analog common
3. All transistors 2N3965
2. All resistors 1/4W, 5%, carbon
1. All diodes 1N9

NOTES: UNLESS OTHERWISE SPECIFIED



4. SCHEMATIC REFERENCE: 430437.
3. ASSEMBLY PROCEDURES AND PROCESSES TO CONFORM WITH DANA WORKMANSHIP STANDARDS.
2. HEAT STAMP .10 HIGH BLACK CHARACTERS LOCATED AS SHOWN.
1. ALL RESISTORS ARE 1/4 W, ±5%, CARBON.

NOTE: UNLESS OTHERWISE SPECIFIED

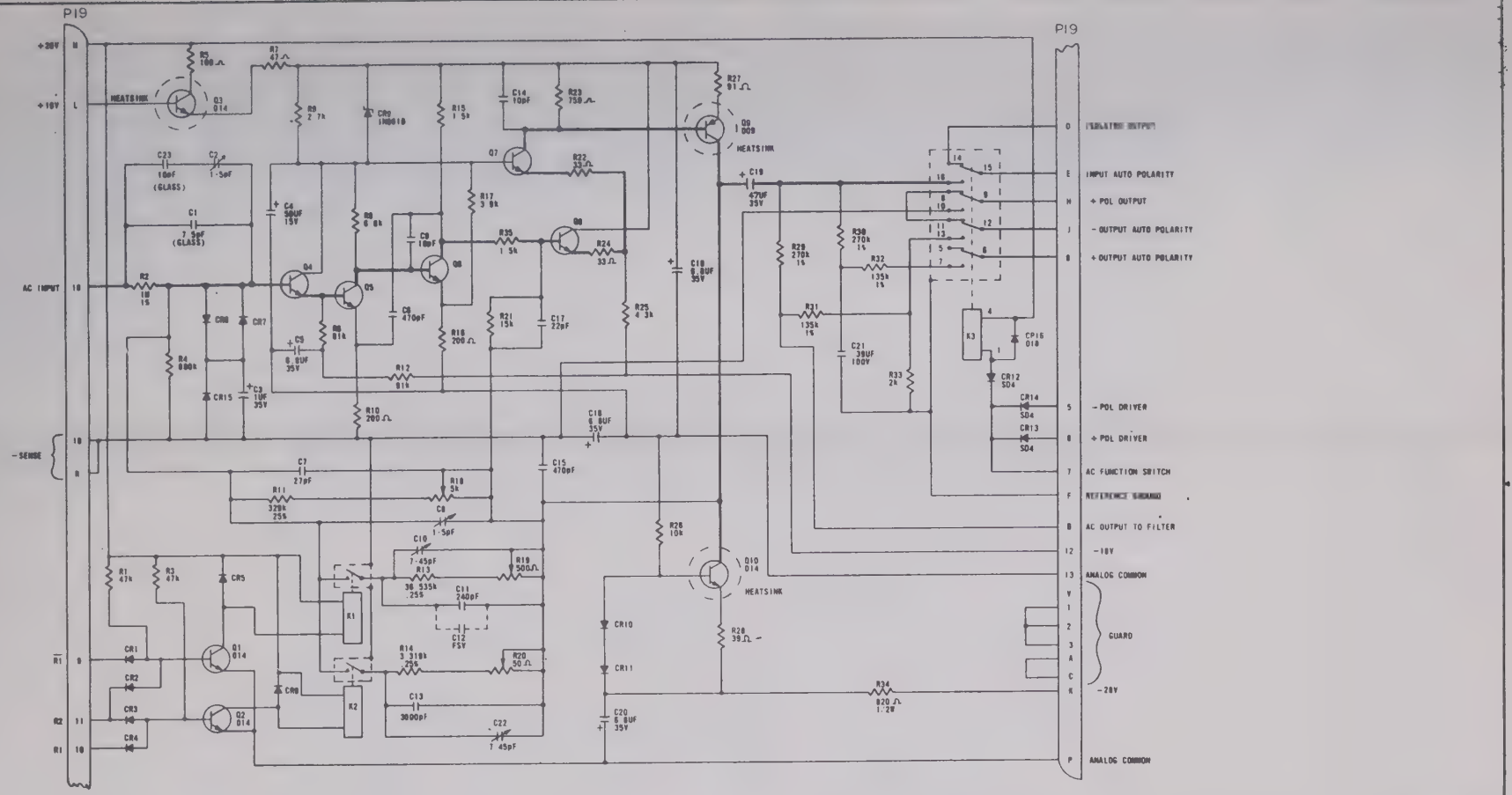
DANA LABORATORIES INC.
IRVINE, CALIFORNIA

PC BOARD ASSY — AC CONVERTER

SIZE	CODE IDENT NO.	DWG NO.	REV
D	21793	402102	F

SCALE 2/1 | WT | SHEET | OF 2

Rev A from 11/24/73
Rev B from 3/4/74



5. [illegible] C23, CR16, K3, Q10, R35
4. ALL VOLTAGES REFERENCED TO ANALOG COMMON.
3. ALL TRANSISTORS TO BE 2N3565.
2. ALL RESISTORS TO BE 1/4W, 5% CARBON
1. ALL DIODES TO BE 018.

NOTE: UNLESS OTHERWISE SPECIFIED

QTY REQD	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION OR VENDOR P/N	ITEM NO.

LIST OF MATERIAL OR PARTS LIST

402102	430(OPTIONAL)	
NEXT ASSY	USED ON	NA / FA
APPLICATION		QTY REQD

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON: DECIMALS X .100, XX .050, XXX .010; ANGLES 0° 30'; FORMED ANGLES 1.0

MATERIAL

FINISH

CONTRACT NO.

DRAWN	I.E. WRYE	6-25-67
CHECK	M. CURTIS	6-29-66
COG. ENGR		
PROJ. ENGR		

C&M 44660 9-2-67 R

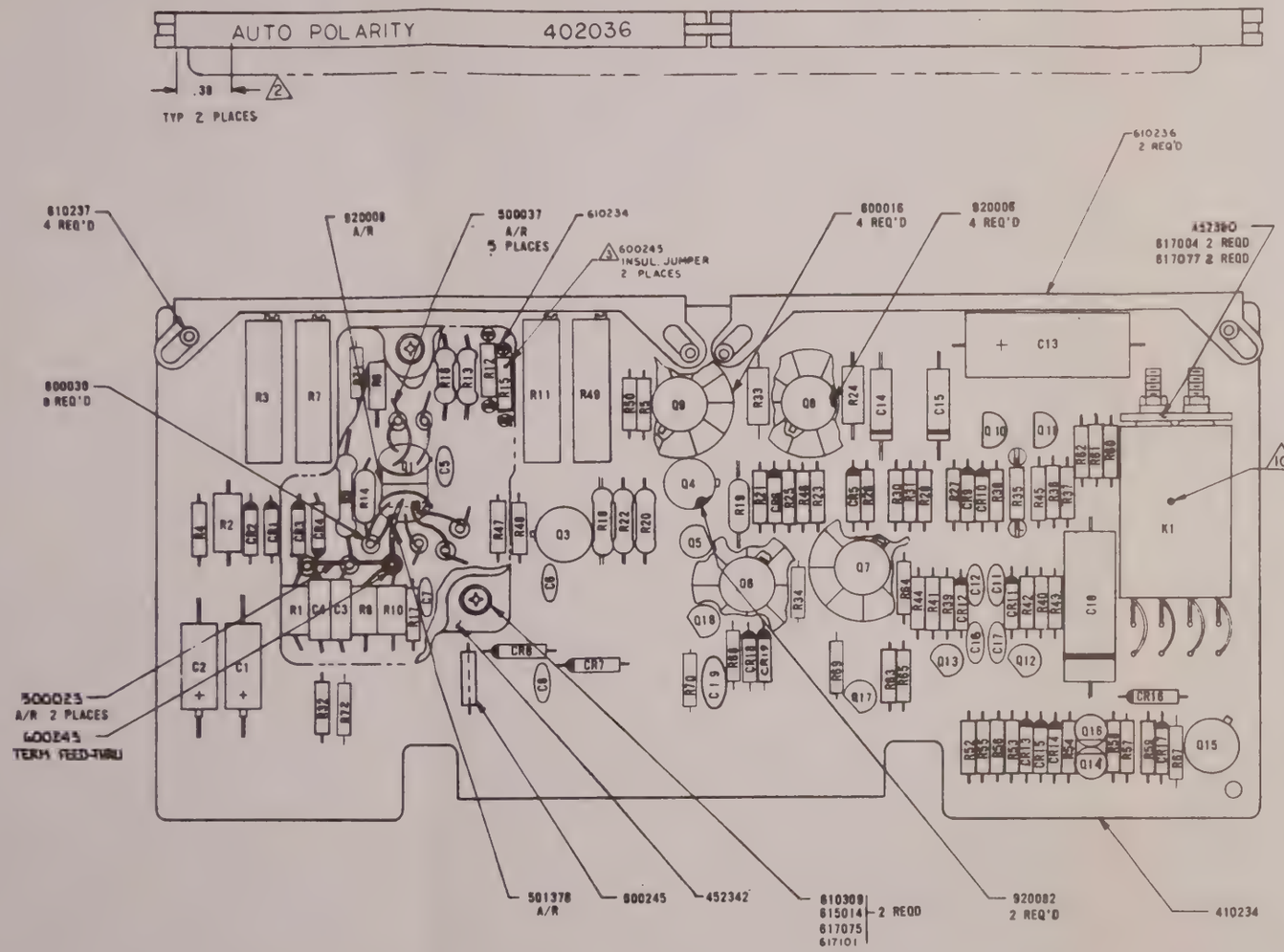
DANA LABORATORIES INC.
IRVINE, CALIFORNIA

SCHEMATIC — A C CONVERTER

SIZE	CODE IDENT NO.	DWG NO.	REV
D	21793	430437	D

SCALE NONE WT SHEET 1 OF 1

AUTO POLARITY 402036



REF DES	PART NO	DESCRIPTION	QTY
CR11	211083	018	0
CR10	211236	007	REF
CR9	211236	007	2
CR8	210011	IN916	REF
CR7	210011	IN916	2
CR6	220007	IN751	1
CR5	221177	1/4W 2.4 AZ10	1
CR4	210010	GE S322	REF
CR3	210010	GE S322	2
CR2	220012	IN958B	REF
CR1	220012	IN958B	2
C19	101174	.001UF DISC	REF
C18	121303	.22 UF 100V	1
C17	100019	.002UF DISC	1
C16	101174	.001UF DISC	REF
C15	120005	.001 UF/100V	REF
C14	120005	.001UF/100V	2
C13	110044	50 UF/50V	1
C12	100010	68pF DISC	REF
C11	100010	68pF DISC	2
C8	101174	.001UF DISC	3
C7	101841	470PF DISC	1
C6	100012	33pf	1
C5	101145	180pF DISC	1
C4	120155	36PF POLY	REF
C3	120155	36PF POLY	2
C2	110039	5uf 50V	REF
C1	110039	5uf 50V	2
REF DES	PART NO	DESCRIPTION	QTY

REF DES	PART NO	DESCRIPTION	QTY
R1	020378	8.975k .025%	1
Q18	200032	2N3646	REF
Q17	200043	2N 3565	REF
Q16	200032	2N4424	REF
Q15	200035	014	REF
Q14	200032	2N4424	2
Q13	200037	2N3646	REF
Q12	200037	2N3646	3
Q11	200043	FAIRCHILD 2N3565	REF
Q10	200043	FAIRCHILD 2N3565	REF
Q9	200035	014	REF
Q8	200011	009	REF
Q7	200035	014	3
Q6	200011	009	2
Q5	200043	2N3565	4
Q4	200040	016	1
Q3	200038	015	1
Q2	200027	015 1ST STG	1
Q1	201084	2N1304	1
K1	311274	RELAY ⚠1	1
CR19	211083	018	REF
CR18	211083	018	REF
CR17	210014	DIODE 023	1
CR16	211083	018	REF
CR15			
CR14			
CR13			
CR12	211083	018	REF
REF DES	PART NO	DESCRIPTION	QTY

REF DES	PART NO	DESCRIPTION	QTY
R72	000222	2.2k	REF
R71	000181	180 OHMS	1
R33	001674	680 OHMS 1/2W	1
R32	000222	2.2k	3
R31	000101	100 OHMS	REF
R30	000220	22 OHMS	REF
R29	000220	22 OHMS	REF
R27	000101	100 OHMS	REF
R26	000820	82 OHMS	1
R25	000220	22 OHMS	3
R24	001712	750Ω 1/2W	1
R23	000203	20k	REF
R22	010187	442k 1%	2
R21	000102	1k	REF
R20	010039	9.09k 1%	1
R19	010080	10k 1%	1
R18	010187	442k 1%	REF
R17	000102	1k	3
R16	010158	200k 1%	REF
R15	001713	FSV 1/4W 5%	REF
R14	010282	140k 1%	1
R13	010158	200k 1%	2
R12	001713	FSV 1/4W 5%	2
R11	040050	5k POT	REF
R10	020378	10k .05% ⚠3	REF
R9	010111	1 MEG	1
R8	020378	10k .05% ⚠3	REF
R7	040004	100k POT	1
R6	010079	7.5k 1%	1
R5	000101	100 OHMS	3
R4	000203	20K	3
R3	040050	5K POT	2
R2	020379	20Ω 1% 1W	1
REF DES	PART NO	DESCRIPTION	QTY

REF DES	PART NO	DESCRIPTION	QTY
R70	000243	24k	REF
R69	000243	24k	2
R68	000194	150k	1
R67	000222	2.2k	REF
R65	000153	15k	REF
R64	000183	18k	REF
R63	000822	8.2k	REF
R62	000202	2k	REF
R61	000680	68 OHMS	1
R60	000202	2k	2
R59	000123	12k	REF
R58	000153	15k	REF
R57	000183	18k	REF
R56	000303	30k	REF
R55	000183	18k	REF
R54	000273	27k	REF
R53	000273	27k	2
R52	000563	56k	1
R50	000822	8.2 k	REF
R49	040003	20K POT	1
R48	000822	8.2k	REF
R47	000105	1MEG	1
R46	000102	1k	REF
R45	000183	18K	4
R44	000123	12k	REF
R43	000303	30K	REF
R42	000822	8.2k	REF
R41	000123	12k	3
R40	000303	30k	3
R39	000822	8.2k	5
R38	000153	15k	REF
R37			
R36	000153	15k	5
R35	000203	20K ⚠1	REF
R34	000103	10k	1
REF DES	PART NO	DESCRIPTION	QTY

REF DES OR ITEM	P/N	DESCRIPTION	QTY
	410234	PC BD AUTO POL	
	A30408	SCHEMATIC AUTO POLARITY	REF
	452342	COVER ENVIRONMENTAL	1
	452390	BRKT RELAY MTG	1
	500037	WIRE BUSS 24 GA	A R
	500023	WIRE BUSS 24 GA	A R
	501378	TUBING TEFLON	A R
	800016	HEAT SINK	4
	800030	TERMINAL TEFLON	8
	800243	TERMNL FEEDTHRU	1
	800245	JUMPER INSUL	3
	810234	STDOFF FORRED TERM	6
	810236	HANDLE-EXTRACTOR	2
	810237	PIN SPRING	4
	810309	STDOFF-SNG #2-56 3/160 X 5/16 LG	2
	615014	SCREW PPH 2-56 X 1/4	2
	617004	HEX NUT 4-40 STD	2
	617075	WASHER INT. LOCK 2	2
	617077	WASHER INT. LOCK 4	2
	617101	WASHER FLAT LSER.2	2
	920006	TRANS PAD-LARGE	5
	920008	CEMENT EASTMAN 910	A/R
	920010	SOLDER BAR	A/R
	920026	SOLDER WIRE	A/R
	920082	TRANS PAD-ROSS 100037	2

⚠1 'FSV' INSTALL 20K 1/4W CARBON RESISTOR IN R35 DURING ASSEMBLY.

⚠2 RELAY MUST BE MOUNTED FLUSH WITH THE CIRCUIT BOARD

⚠3 PART OF AN AUTO POLARITY GAIN RESISTOR SET (P/N 020378)

~~6. FOR SOCKETS TO BE INSTALLED FROM PARTING.~~

7. AFTER HUMISEAL BAKE AT 85°C FOR TWO HOURS.

5. ASSEMBLY PROCEDURES AND PROCESSES TO CONFORM TO DANA WORKMANSHIP STANDARDS.

4. SCHEMATIC REFERENCE: 430408

⚠2 600243 INSULATED JUMPERS TO BE INSTALLED FOR R12 AND R15 DURING ASSEMBLY.

⚠2 HEAT STAMP .18 HIGH BLACK CHARACTERS LOCATED AS SHOWN.

1. ALL RESISTORS TO BE 1/4 W ±5%, CARBON.

NOTE: UNLESS OTHERWISE SPECIFIED

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

P.C. BOARD ASSY - AUTO POLARITY

SIZE	CODE IDENT NO.	DWG NO.	REV
D	21793	402036	AE

SCALE 2/1 WT SHEET 1 OF 1

P20

+POL DRIVER N
-POL DRIVER P
START/STOP FLIP FLOP V
+28V M
+18V 10
ANALOG COMMON 7
INPUT D
-SENSE C
DIGITAL COMMON 17
ISO OUTPUT 14
-18 V 6
-28 V E
-SENSE 5
-OUTPUT J
+OUTPUT 3
AC 15
OUTPUT SENSE 1
A/D INPUT A
GUARD 18
0'S 12
9'S 13
EXT. COMMAND 16

R5 100
C13 50UF 50V
C1 5UF 50V
CR1 1N958B
R6 7.5K 1%
R7 100K
Q1 2N1304
R71 160
R9 1MEG
R1 9.97534K .025% HIGH SPEED
CR3 GES322
CR4 GES322
C2 5UF 50V
CR2 1N958B
R11 5K
R12 FSV
R15 FSV
R13 200K 1%
R16 200K 1%
C5 100PF
R48 8.2K
C6 33PF
C7 470PF
R47 1MEG
R49 20K
R50 8.2K
Q2 015
Q3 015
Q4 016
R17 1K
R14 140K 1%
R21 1K
R23 20K
C8 0.001UF
R18 442K 1%
R20 9.09K 1%
R22 442K 1%
CR5 1/4M 2.4 AZ5
R46 1K
R8 10K .05% HIGH SPEED
C3 36PF POLY
R10 10K .05% HIGHSPEED
C4 36PF POLY
K1
R2 20 ±1%WW
R3 5K
R4 20K
R31 100
C14 0.001UF 100V
Q9 014
R30 22
R33 680 1/2W
HEATSINK
R19 10K 1%
2N3565
CR6 IN751 5.1V
R25 22
HEATSINK
Q6 009
HEATSINK
Q7 014
R26 82
Q8 009
R24 750 1/2W
HEATSINK
R28 22
C15 0.001UF 100V
R27 100
R35 FSV
R36 15K
C11 68PF
C12 68PF
R37 15K
R38 15K
Q10 2N3565
Q11 2N3565
R41 12K
R44 12K
R61 68
R60 2K
R62 2K
R34 10K
CR9 007
CR 10 007
R39 82K
R42 5.2K
R40 30K
R43 30K
CR11
Q12 2N3646
Q13 2N3646
CR12
CR7 A
CR8 A
R72 2.2K
R32 2.2K
R45 16K
CR16
R67 2.2K
K1
R59 12K
Q15 014
CR17 023
R52 56K
R55 16K
R57 16K
R53 27K
C18 0.22UF/100V
R58 15K
Q16 2N4424
C16 0.001UF
CR13
R54 27K
C17 0.002UF
CR14
CR15
Q14 2N4424
R56 30K
R64 16K
CR18
CR19
R63 8.2K
Q17 2N3565
R65 15K
+28
R70 24K
R69 24K
R68 150K
-28
Q18 2N3646
DIG COM
C19 0.001UF
DIG COM

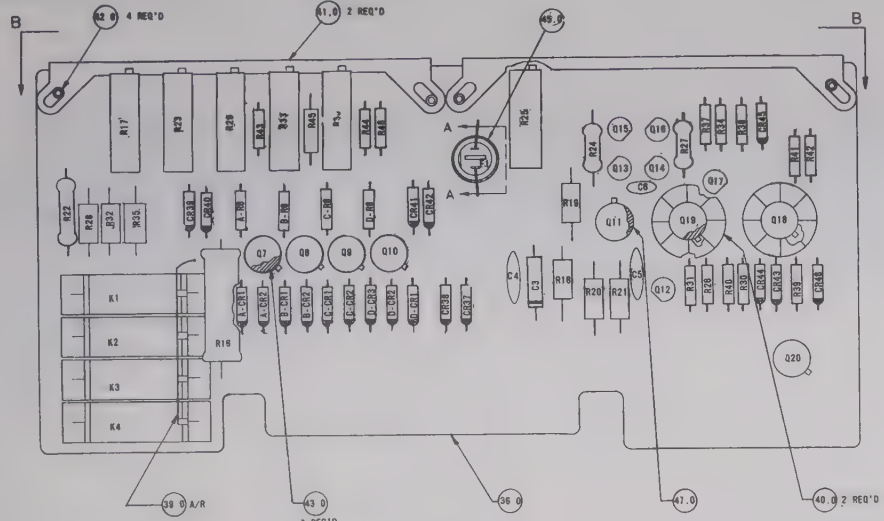
A SELECTED IN916 DIODE DANA P/N 210011.
4. REFERENCE DESIGNATORS NOT USED: C9, C18, R29, R51, R66
3. HIGHEST NUMBERED REFERENCE DESIGNATORS: C19, CR19, R72, Q18
2. RESISTOR TO BE (IN OHMS) 1/4 W, 5 % CARBON
1. DIODES TO BE 018
NOTES: UNLESS OTHERWISE SPECIFIED

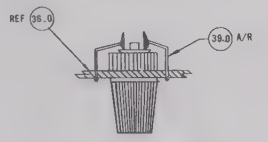
DANA LABORATORIES INC.
IRVINE, CALIFORNIA

SCHEMATIC - AUTO POLARITY

SIZE	CODE IDENT NO.	DWG NO.	REV
D	21793	430406	U

SCALE NONE | SHEET 1 OF 1



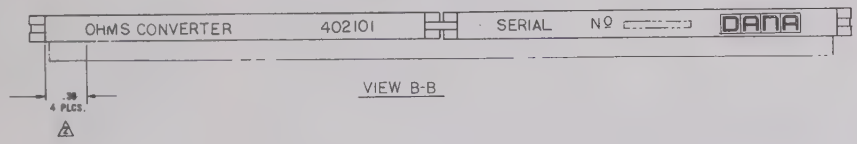


SECTION A-A

REF DES	B/M ITEM	DESCRIPTION
R42	7.5	680 OHMS
R41	3.5	1.8 K
R40	5.5	270 OHMS
R39	5.7	33 K
R38	3.0	18 K
R37	3.0	18 K
R36	19.0	5 k POT
R35	16.9	489.5 OHMS .1%
R34	4.0	2 K
R33	18.0	5 k POT
R32	16.5	4.985 k .1%
R31	2.0	1.5 K
R30	7.0	82 K
R29	20.0	200 OHMS POT
R28	13.5	50 5 K .1%
R27	9.0	54.9 K .1%
R26	5 0	2.4 K
R25	18.0	10 K POT
R24	9.0	54 9 K .1%
R23	21 0	2 k POT
R22	11.0	555.5 K .1%
R21	16.0	20 K WW .01%
R20	13 0	5.01G k .01%
R19	13 0	5.010 k .01%
R18	16 0	20 K WW .01%
R17	18 3	20 k POT
R16	10.0	5.0 M .1%
R8	8.0	47 K

REF DES	B/M ITEM	DESCRIPTION
K4	35.0	#280-1A-24 RELAY
K3		
K2		
K1	35.0	#280-1A-24 RELAY
F1	46.0	0.1 AMP
CR46	33.5	1N988
CR45	34.0	1/4W 2.4AZ5 ZENER
CR44	33.0	018
CR43		018
CR42		018
CR41		018
CR40		018
CR39	33.0	018
CR38	32.0	SD4
CR37	32 D	SD4
CR3	33 0	018
CR2		
CR1	33 0	018
C6	24.0	100 pF DISC
C5	25.0	.001 UF DISC
C4	25.0	.001 UF DISC
C3	27.0	.0047 UF/100V
R46	5.0	2.4 k
R45	11.5	10 OHMS 1%
R44	8.0	4.7 k
R43	3.8	20 OHMS

REF DES	B/M ITEM	DESCRIPTION
Q20	29.0	014
Q19	28 0	009
Q18	29.0	014
Q17	31.0	2N3585
Q16		
Q15		
Q14		
Q13		
Q12	31.0	2N3585
Q11	30.0	016
Q10	29.0	014
Q9		
Q8		
Q7	29.0	014



VIEW B-B

CROSS REFERENCE CHART	
ITEM NO.	PART NO.
38.0	410258 D
39.0	500004
40.0	801018
41.0	810238
42.0	810237
43.0	920006
45.0	920053
47.0	920082

4. REFERENCE SCHEMATIC NO. 430436
3. ASSEMBLY PROCEDURES AND PROCESSES TO CONFORM WITH DANA WORKMANSHIP STANDARDS.
2. HEAT STAMP .18 HIGH BLACK CHARACTERS AND .18 HIGH LOGO, LOCATED AS SHOWN.
1. ALL RESISTORS ¼W, CARBON, 5%.

NOTES UNLESS OTHERWISE SPECIFIED

NEXT ASSY	USED ON	NA	FA
402101	130	1	1
APPLICATION		QTY REQD	

QTY REQD	SYM	ITEM NO.	GOVT OR VENDOR NO.	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION

LIST OF MATERIAL OR PARTS LIST

MATERIAL
APPLIED FINISH
HEAT TREATMENT

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON DECIMALS: .X ± .030, .XX ± .020, .XXX ± .010; ANGLES ± 0° 30'
FORMED ANGLES ± 1.0°
ECCENTRICITY BETWEEN DIA ON THE SAME AXIS SHALL NOT EXCEED .010 TIR.
INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS MIL-D-1000 AND MIL-D-70327

CONTRACT NO.

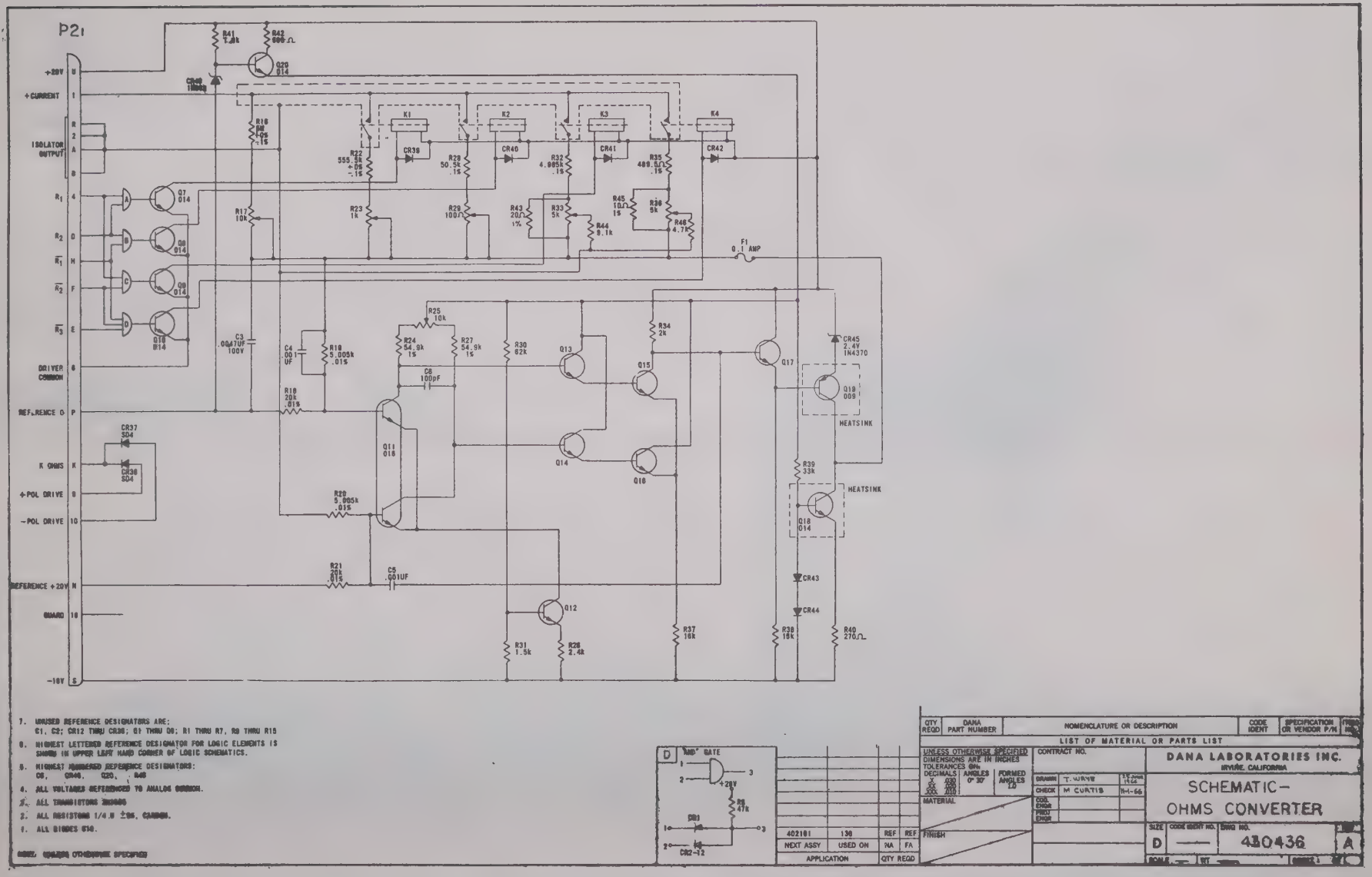
DANA LABORATORIES INC.
IRVINE, CALIFORNIA

	NAME	DATE
DR	R WOOD	29 MAR 66
CHK		
APPD		

PC BOARD ASSY-
OHMS CONVERTER

SIZE	CODE IDENT NO.	DWG NO.	
D	—	402101	B

SCALE 2 / 1 WT — SHEET 1 OF 1



1. UNUSED REFERENCE DESIGNATORS ARE:
   C1, C2; CR12 THRU CR36; Q1 THRU Q6; R1 THRU R7, R9 THRU R15
2. HIGHEST LETTERED REFERENCE DESIGNATOR FOR LOGIC ELEMENTS IS SHOWN IN UPPER LEFT HAND CORNER OF LOGIC SCHEMATICS.
3. HIGHEST NUMBERED REFERENCE DESIGNATORS:
   CR8, CR40, Q20, R48
4. ALL VOLTAGES REFERENCED TO ANALOG COMMON.
5. ALL TRANSISTORS 2N3906
6. ALL RESISTORS 1/4 W ±5%, CARBON.
7. ALL DIODES 914.

NEXT ASSY: UNLESS OTHERWISE SPECIFIED

D — NAND GATE

QTY REQD	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION OR VENDOR P/N	ITEM NO.
		LIST OF MATERIAL OR PARTS LIST			

402181	130	REF	REF
NEXT ASSY	USED ON	NA	FA
APPLICATION		QTY REQD	

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON:
DECIMALS | ANGLES
.XX ±.030 | 0° 30'
.XXX ±.010 |
FORMED ANGLES ±0

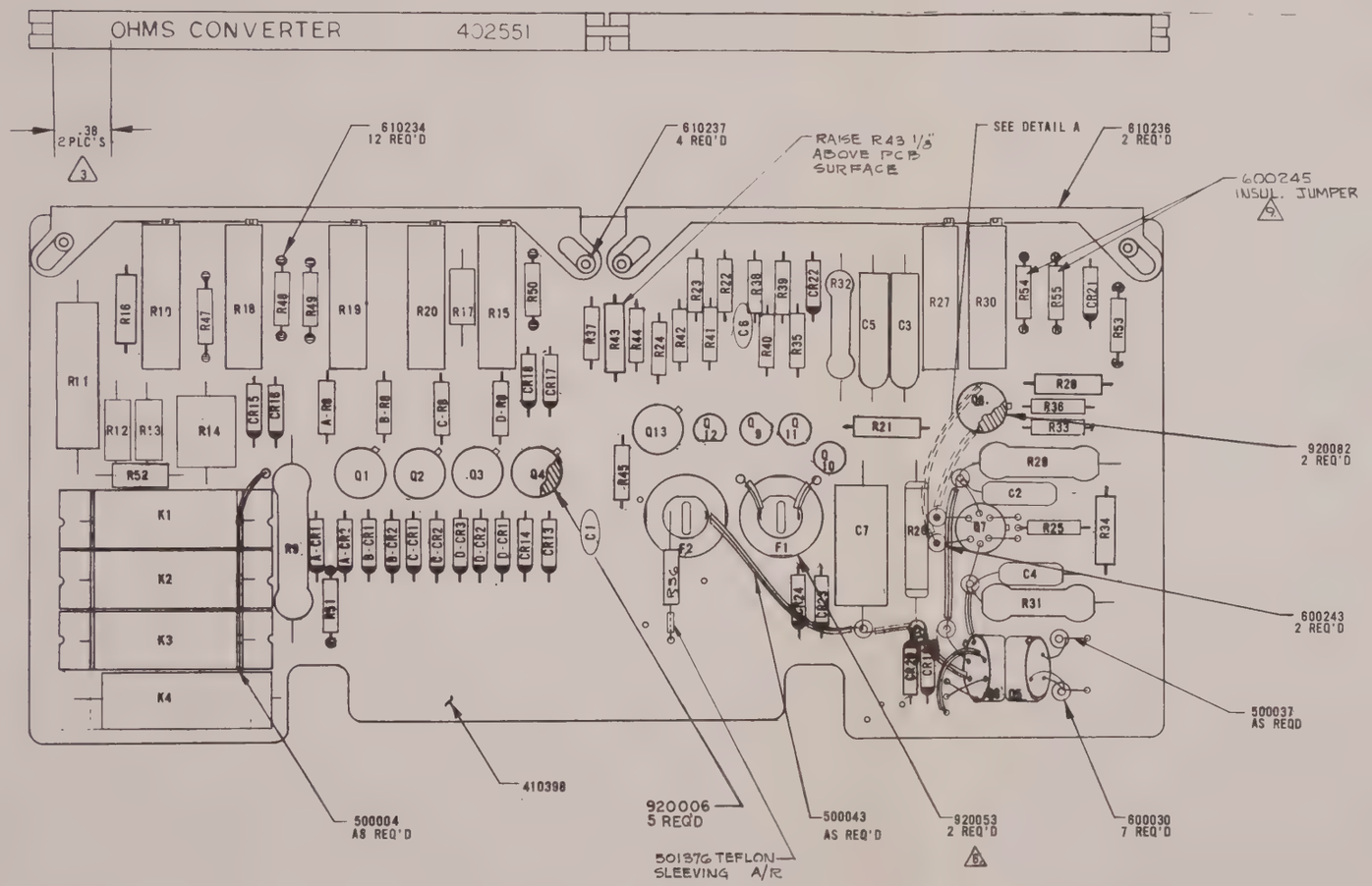
CONTRACT NO.

DRAWN T. WRAY 11-1-66
CHECK M CURTIS 11-1-66
COG ENGR
PROJ ENGR
MATERIAL
FINISH

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

SCHEMATIC—
OHMS CONVERTER

SIZE D | CODE IDENT NO. — | DWG NO. 430436 | REV A
SCALE — | WT — | SHEET 1 OF 1



REF DES	PART NO.	DESCRIPTION	QTY
F1	920054	1 10 AMP	
CR24	211083	018	
CR23	211083	018	
CR22	221254	IN961A	
CR21	221254	IN961A	
CR20	211236	007	
CR19	211236	007	
CR18	211083	018	
CR17	↕	↕	
CR16			
CR15	211083	018	
CR14	210004	SD4	
CR13	210004	SD4	
CR3	211083	018	
CR2	211083	018	
CR1	211083	018	
	410398	PC BOARD	1
	600030	TERMINAL REF	7
	600243	TERMINAL FEED THRU	2
	610234	TERMINAL FORKED	16
	610236	HANDLE EXTRACTOR	2
	610237	PIN-SPRING	4
	920006	TRANS-PAD	5
	920053	FUSE HOLDER	2
	920082	TRANS-PAD DUAL	2
	430714	SCHEMATIC	REF
	500037	WIRE 34GA BUSS	A/R
C7	120094	.0051UF 500V	
C8	101174	.011UF DISC	
C5	110001	6.8UF. 35V	
C4	121473	.0015UF, 100V	
C3	110001	6.8UF. 35V	
C2	121473	.0015UF, 100V	
C1	101174	.011UF DISC	

REF DES	PART NO.	DESCRIPTION
R56	501376	TEFLON SLEEVING
R17	020386	10k .1%
R16	020401	10.34k.1%
R15	040004	100k POT
R14	020438	2.0088k,.1%
R13	020399	20.153k,.1%
R12	020403	201.0k 0.1%
R11	010338	1 MEG. .1%
R10	040005	10k POT
R9	010339	10.104M,.1%
R8	000473	47k
	500004	WIRE 22GA BUSS A/R
	500043	WIRE WHT 24 GA TEF A/R
Q13	200052	009
Q12	200022	012
Q11	200043	2N3565
Q10	↕	↕
Q9	200043	2N3565
Q8	200040	016
Q7	200040	011
Q6	200027	1st STAGE DUAL
Q5	201084	2N1304
Q4	200035	014
Q3	↕	↕
Q2		
Q1	200035	014
	920010	SOLDER BAR A/R
	920026	SOLDER WIRE A/R
K4	310024	RELAY
K3	310013	RELAY
K2	310013	RELAY
K1	310013	RELAY
R54	600245	INSUL. JUMPER
R55	600245	INSUL. JUMPER
F2	920260	1/64 AMP

REF DES	PART NO.	DESCRIPTION
R56	000472	4.7K 1/4W ±5%
R55	001737	FSV 5
R54	001737	FSV 5
R53	001737	FSV 1
R52	020469	121k 0.1%
R51	000513	FSV 51K 8
R50	000364	↕ 360K 8
R49	000275	2.7M 8
R48	000821	↕ 820Ω 8
R47	000182	FSV 1.8K 8
R45	000101	100
R44	000332	3.3k
R43	020119	680Ω 3W,1%
R42	000822	8.2k
R41	000202	2k
R40	000152	1.5k
R39	000473	47k
R38	000151	150
R37	000151	150
R36	000513	51k
R35	000202	2k
R34	010158	200k 1%
R33	000513	51k
R32	010236	10 MEG 1%
R31	010236	10 MEG 1%
R30	040059	1 MEG POT
R29	010236	10 MEG 1%
R28	010039	9.09k 1%
R27	040004	100k POT
R26	010320	25 MEG 2%
R25	000681	680Ω
R24	000103	10k
R23	000511	510Ω
R22	000432	4.3k
R21	010158	200k, 1%
R20	040055	500k POT
R19	040084	200Ω POT
R18	040066	1k POT

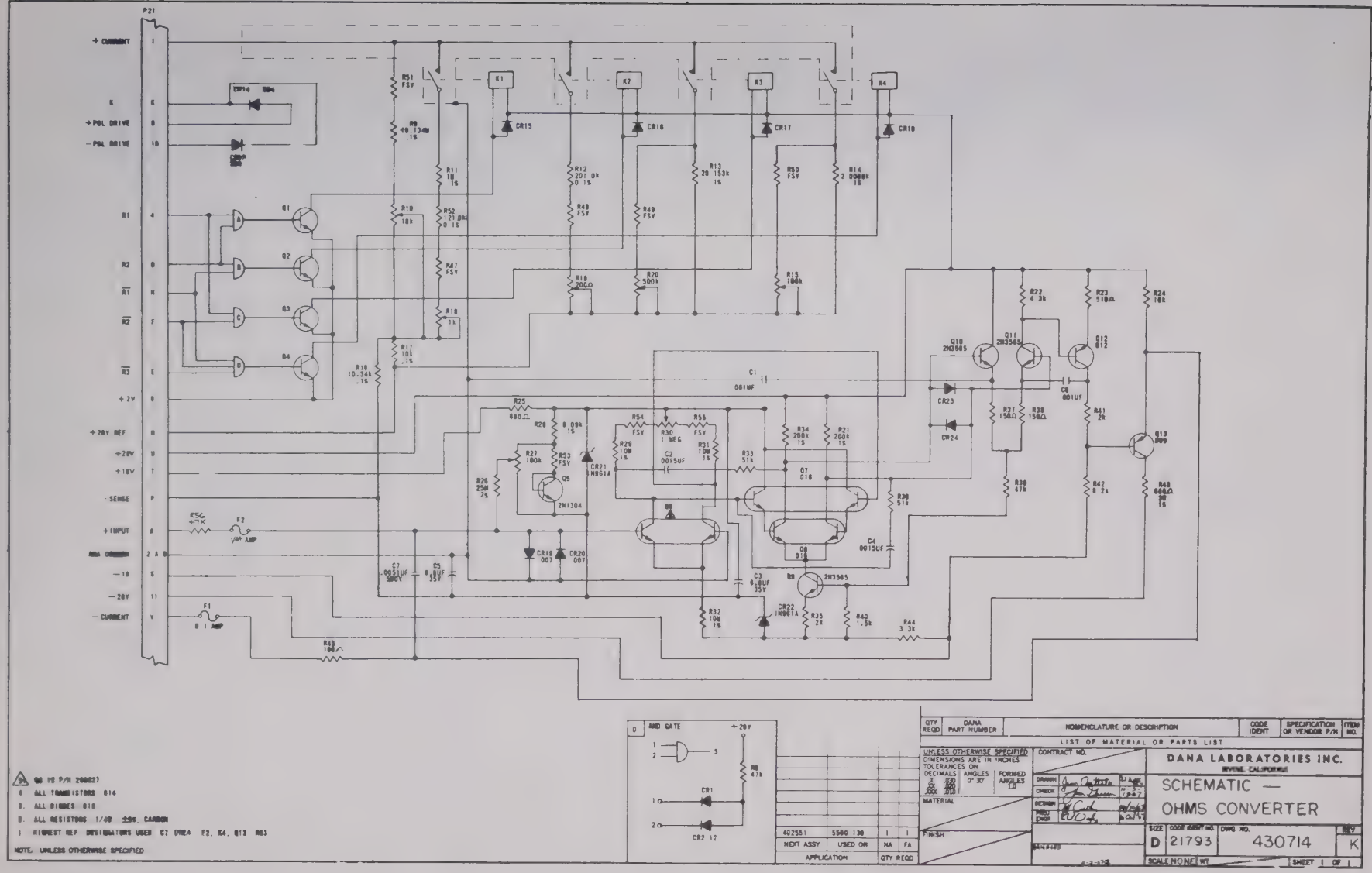
9 INSTALL INSULATED JUMPERS P/N 600245 ON INITIAL ASSY.
8 INSTALL VALUE SHOWN FOR "FSV" ON INITIAL ASSY.
7 INSTALL 75Ω 1/4W, 000750 ON INITIAL ASSY
6 USE "O" RING ON FARSIDE OF BOARD
5. SCHEMATIC REFERENCE: 430714.
4. ASSEMBLY PROCEDURES AND PROCESSES TO CONFORM TO DANA WORKMANSHIP STANDARDS.
3. HEAT STAMP .10 HIGH BLACK CHARACTERS ——— LOCATED AS SHOWN.
2. REFERENCE DESIGNATORS NOT USED: R46
1. ALL RESISTORS TO BE 1/4W, ±5%, CARBON.
NOTE: UNLESS OTHERWISE SPECIFIED

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

P.C. BOARD ASS'Y — OHMS CONVERTER

SIZE	CODE IDENT NO.	DWG NO.	REV
D	21793	402551	8

SCALE 2:1 | WT | SHEET 1 OF 1



D AND GATE +20V

1 2 3 R8 47k CR1 CR2 1 2

QTY REQD	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION OR VENDOR P/N	ITEM NO.
		LIST OF MATERIAL OR PARTS LIST			

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON DECIMALS .XX ±.02 .XXX ±.010 ANGLES 0° 30' FORMED ANGLES ±1°

MATERIAL

FINISH

CONTRACT NO.

DRAWN CHECK DESIGN PROJ ENGR

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

SCHEMATIC — OHMS CONVERTER

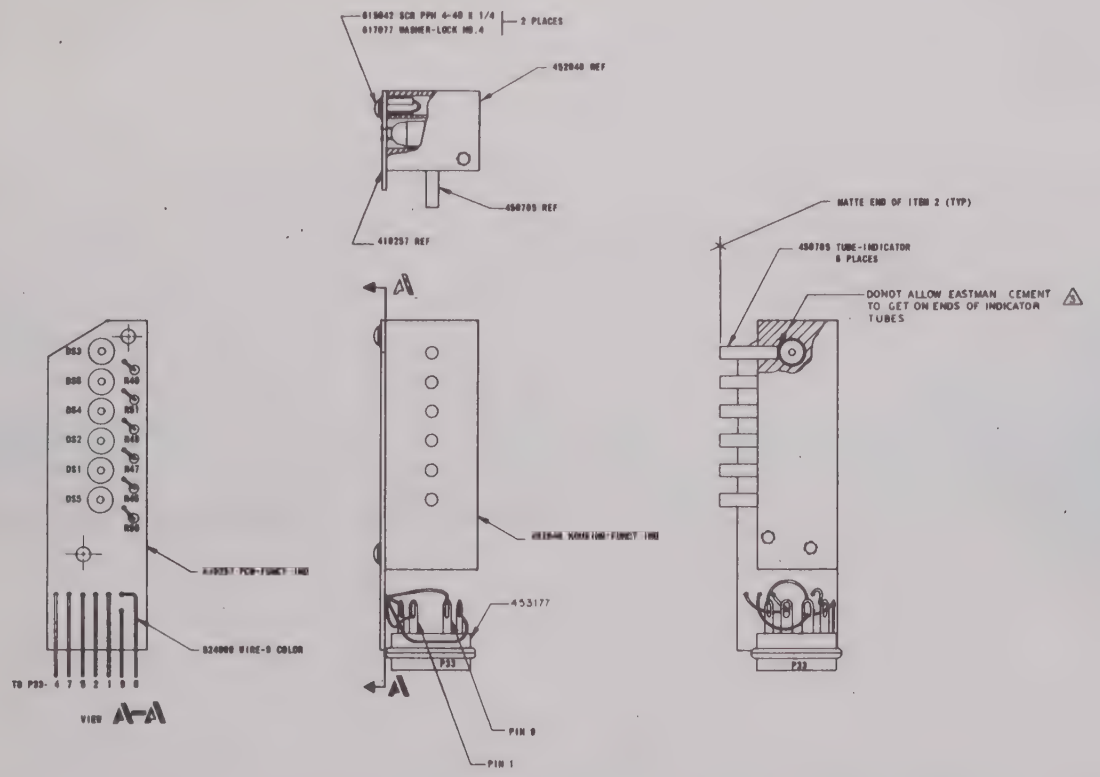
SIZE	CODE IDENT NO.	DWG NO.	REV
D	21793	430714	K

SCALE NONE WT SHEET 1 OF 1

402551	5500 130	1	1
NEXT ASSY	USED ON	NA	FA
APPLICATION		QTY REQD	

6A IS P/N 290827
4. ALL TRANSISTORS 814
3. ALL DIODES 818
2. ALL RESISTORS 1/4W ±5%, CARBON
1. HIGHEST REF DESIGNATORS USED C7 D9EA F2, R4, R13 R43

NOTE: UNLESS OTHERWISE SPECIFIED



REF DES ITEM	P/N	DESCRIPTION	QTY
DS1	520110	LAMP-NEON	6
DS2	520110	LAMP-NEON	REF
DS6	520110	LAMP-NEON	REF
P33	453177	SOCKET-6 PIN MODIFIED	1
R46	500014	RES-510A	6
R47	500014	RES-510A	REF
R51	500014	RES-510A	REF
	410257	PCB-FUNCTION INDICATOR	1
	450785	TUBE-INDICATOR	6
	452040	HOUSING-FUNCTION INDICATOR	1
	534000	WIRE-6 COLOR	A/R
	510042	SCREW PAN 4-40 X 1/4	2
	517077	WASHER-LOCK NO. 4	2
	500008	SOLDER-DIXIE	A/R
	980008	EASTMAN 910	A/R

QTY REQD	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION OR VENDOR P/N	ITEM NO.
		LIST OF MATERIAL OR PARTS LIST			

402553	130	1	1
NEXT ASSY	USED ON	NA	FA
APPLICATION		QTY REQD	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON: DECIMALS .XX ±.03, .XXX ±.010; ANGLES ±1°30'; FORMED ANGLES 1.0

MATERIAL

FINISH

CONTRACT NO.

DRAWN TTT 10-17-68

CHECK GW 10-18-68

ENG APPR. 10-18-68

MFG APPR. 10-18-68

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

ASSEMBLY FUNCTION INDICATOR

SIZE D | CODE IDENT NO. 21793 | DWG NO. 402100 | REV E

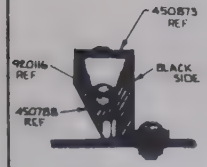
SCALE 2/1 | WT | SHEET 1 OF 1

⚠ 3 DWG 450789, INDICATOR TUBES, IN 452040 HOUSING, TANGENT TO HOLES, AS SHOWN, WITH EASTMAN 910 (EMBANIT (930003))

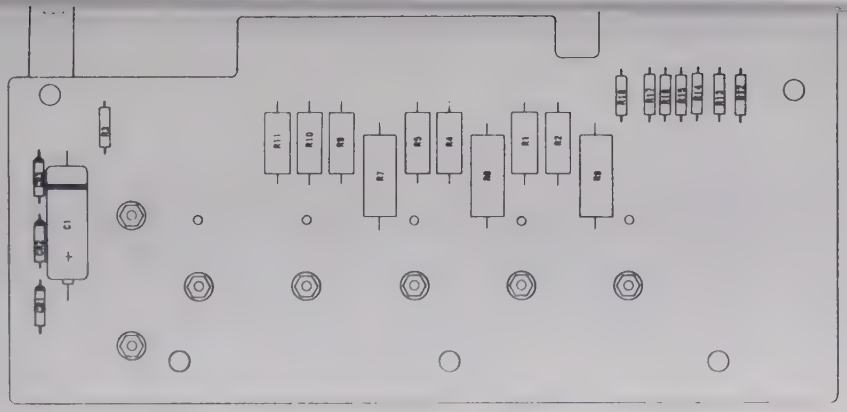
2. ASSEMBLY PROCEDURES AND PROCESSES TO [illegible]

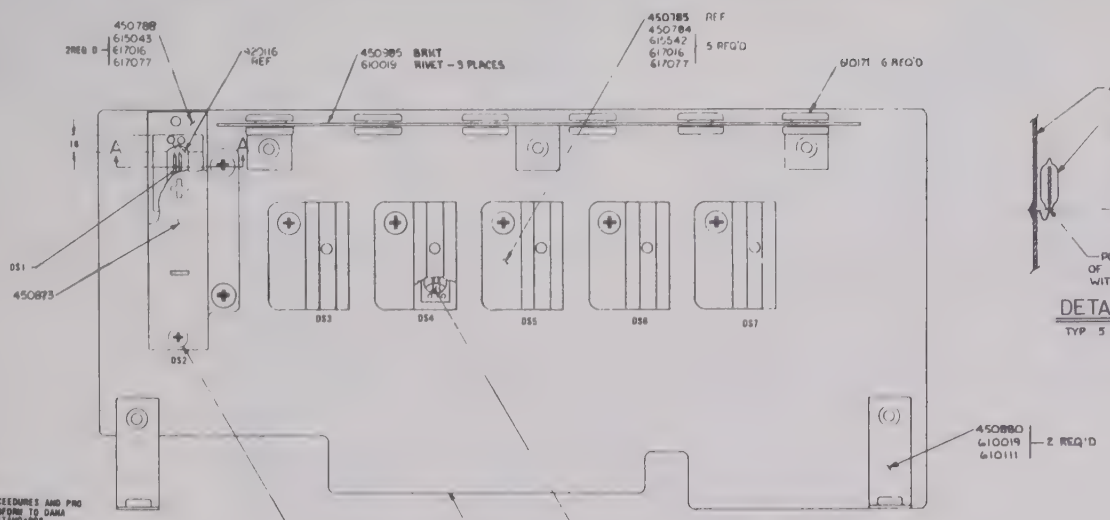
1. [illegible] REFERENCE NO. 410484

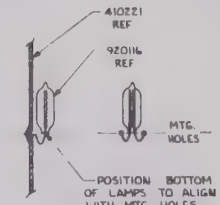
NOTES: UNLESS OTHERWISE SPECIFIED



SECTION A-A







DETAIL "A"
TYP 5 PLACES

QTY REQ'D PER UNIT	P/N	DESCRIPTION	QTY	QTY REQ'D PER UNIT	P/N	DESCRIPTION	REF
C1	110041	250 MF/6V	1		450784	HOUSING MAGN INDICATOR	5
CR1	210004	SD4	3		450785	TUBE-INDICATOR	11
CR2	210004	SD4	REF		450788	HOUSING FUNCTION READOUT	1
CR3	210004	SD4	REF		450873	DISPLAY SCREEN-POLARITY	1
R1	001107	39k 1/8 5%	2		450917	DISPLAY SCREEN	
R2	001090	20k 1/8 5%	2				
R3	000224	270k	1				
R4	001107	39k 1/8 5%	REF				
R5	001090	20k 1/8 5%	REF		450900	CONT-STD. DISPLAY CARD	6
R6	030005	100k 2W 5%	3				
R7	030005	100k @W 5%	REF		450905	CONT-PLUGOUT TUBE	1
R8	030005	100k 2W 5%	REF		610018	RIVET-1/8 SEMI-TUB 3 5/32 LG	11
R9	030012	130k 1/8 5%	3				
R10	030012	130k 1/8 5%	REF		610111	CONT-PRESS. 6-40	3
R11	030012	130k 1/8 5%	REF		610171	MANDREL-BRASS TUB 5/16 OD X 3/16 ID	9
R12	030012	130k	7				
R13	000014	910k	REF				
R14	000014	910k	REF		810280	SCR PPH 2-56 X 3/16 LG P DELRYAP	8
R15	000014	910k	REF				
R16	000014	910k	REF				
R17	000014	910k	REF		815043	SCR PPH 4-40 X 5/16	17
R18	000014	910k	REF		815542	SCR PPH 4-40 X 5/16	18
	410221	PC BD-DISPLAY	1		817016	HEX NUT 4-40BRASS	7
	430388	SCREEN-DISPLAY 5 DIGIT	A R		817077	WASH INT LOCK 4	7
					820010	SOLDER-BAR	A/R
					830110	LAMP-NEON	7

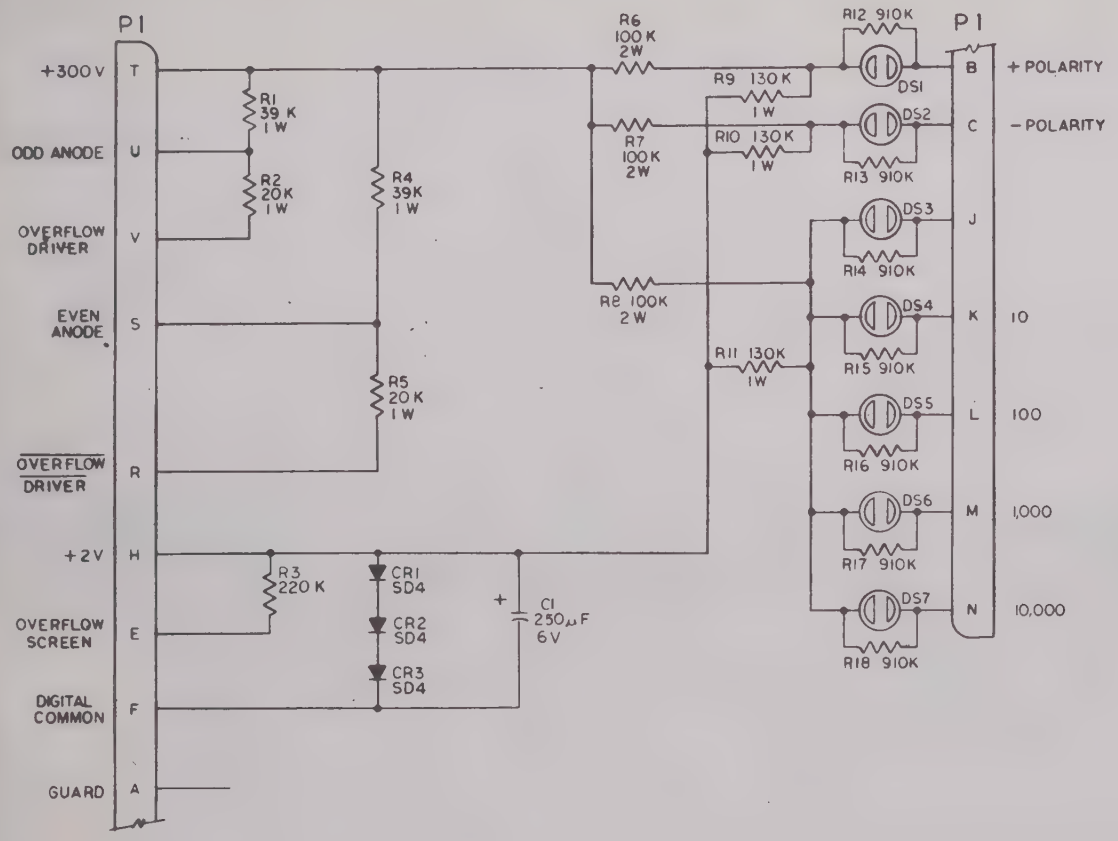
5. ASSEMBLY PROCEEDURES AND PRO CESSES TO CONFORM TO DANA WORKMANSHIP STANDARDS
4 GEOMATIC REFERENCE 430300
R1 RESISTORS TO BE CARBON 1/8 W 5.0 %
1. ALL NEON LAMPS ARE MS-2N, 920116 NOVL UNLESS OTHERWISE SPECIFIED

DANA LABORATORIES INC.
IRVINE CALIFORNIA

PC BOARD ASSY — DISPLAY 5 DIGIT

SIZE	CODE IDENT NO.	DWG NO.	REV
D	21793	400890	H

SCALE 2:1 SHT



QTY REQD	SYM	ITEM NO.	GOV'T OR VENDOR NO.	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION

LIST OF MATERIAL OR PARTS LIST

4. REFERENCE DESIGNATORS NOT USED: NONE

3. HIGHEST REFERENCE DESIGNATORS:
C1 DS7
CR3 R18

2. ALL NEON LAMPS ARE NE-2H

1. RESISTORS TO BE CARBON, ±5%, 1/4 W.

NOTES: UNLESS OTHERWISE SPECIFIED

400890	5500	REF	REF
NEXT ASSY	USED ON	NA	FA
APPLICATION		QTY REQD	

MATERIAL

APPLIED FINISH

HEAT TREATMENT

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON DECIMALS: .X ± .030, .XX ± .020, .XXX ± .010; ANGLES ± 0° 30'
FORMED ANGLES ± 1.0°
ECCENTRICITY BETWEEN DIA ON THE SAME AXIS SHALL NOT EXCEED .010 TIR.
INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS MIL-D-1000 AND MIL-D-70327

CONTRACT NO.

	NAME	DATE
DR	W. Edie	25 APR 1966
CHK		10/9/66
APPD		4/67

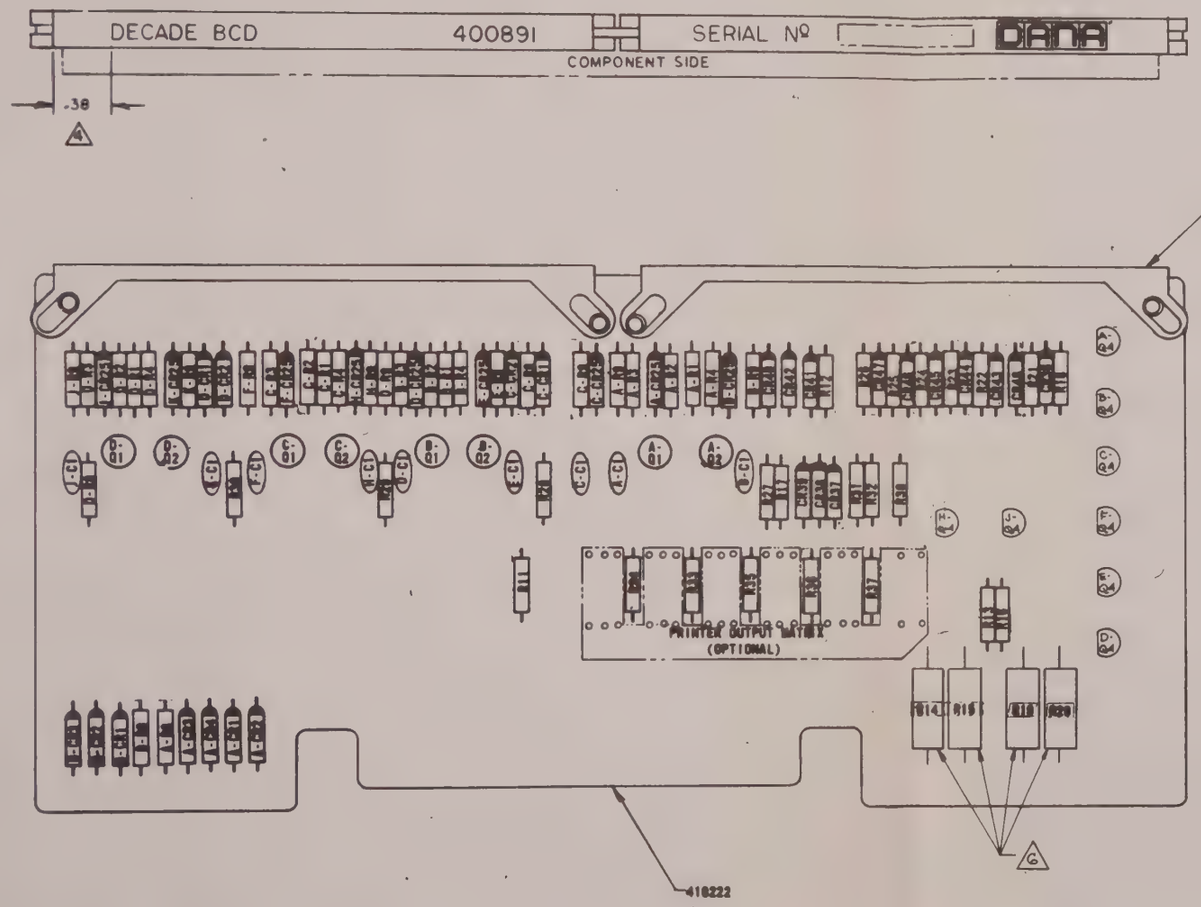
DAN = 60°
4-20-67 CJ

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

SCHEMATIC - DISPLAY

SIZE	CODE IDENT NO.	DWG NO.	
C	—	430389	A

SCALE — WT — SHEET 1 OF 1



REF DES	PART NO.	DESCRIPTION	
R16	000103	10 K	REF
R15	001107	39 K, 1 W	2
R14	001898	20 K, 1 W	2
R13	000103	10 K	REF
R12	000103	10 K	11
R11	000204	200 K	2
R9	000273	27 K	9
R8	000243	24 K	4
R4	000153	15 K	REF
R3	000122	1.2 K	REF
R2	000153	15 K	8
R1	000122	1.2 K	8
Q4	200079	021	8
Q2	200037	2N3646	REF
Q1	200037	2N3646	8
CR48	211083	018	REF
THRU			
CR36	211083	018	REF
CR25	211083	018	REF
CR4			
CR3			
CR2			
CR1	211083	018	33
E-C1	100005	22PF DISC	1
C1	101182	47 PF DISC	8

REF DES	PART NO.	DESCRIPTION	
R36	000204	200 K	REF
R37	000473	47 K	REF
THRU			
R33	000473	47 K	5
R32	000583	58 K	1
R31	000883	88 K	1
R30	000223	22 K	REF
THRU			
R27	000223	22 K	4
R26	000103	10 K	REF
THRU			
R21	000103	10 K	REF
R20	001898	20 K, 1 W	REF
R19	001107	39 K, 1 W	REF
R18	000103	10 K	REF
R17	000103	10 K	REF

⚠6 MOUNT R14, R15, R19, & R20 1/8 OFF P.C. BOARD

5. DO NOT HUMISEAL THIS ASSEMBLY.

⚠4 HEAT STAMP .10 HIGH BLACK CHARACTERS AND .15 HIGH LOGO, LOCATED AS SHOWN.

3. SCHEMATIC REFERENCE: 430300.

2. ASSEMBLY PROCEDURES AND PROCESSES TO CONFORM WITH DANA WORKMANSHIP STANDARDS.

1. ALL RESISTORS ARE 1/4 W, 2 %, CARBON.

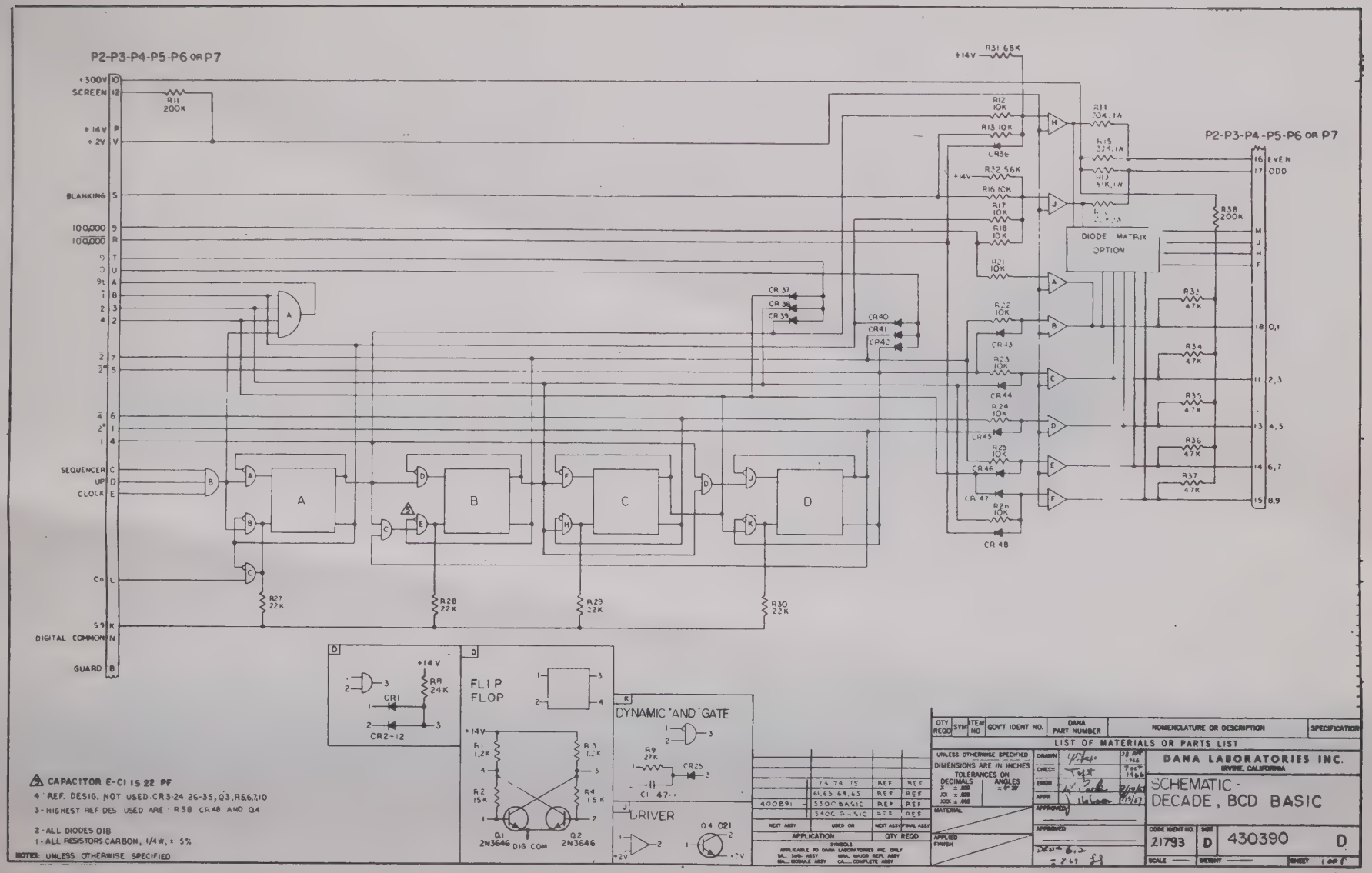
NOTE: UNLESS OTHERWISE SPECIFIED

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

PC BOARD ASSY — DECADE, BASIC

SIZE	CODE IDENT NO.	DWG NO.	REV.
D	21793	400891	R

SCALE 2/1 WT. SHEET 1 OF 1



⚠ CAPACITOR E-C1 IS 22 PF

4 REF. DESIG. NOT USED CR3-24 26-35, Q3, R5,6,7,10

3 - HIGHEST REF DES USED ARE : R38 CR48 AND Q4

2 - ALL DIODES 018

1 - ALL RESISTORS CARBON, 1/4W, ± 5%.

NOTES: UNLESS OTHERWISE SPECIFIED

QTY REQD	SYM	ITEM NO	GOV'T IDENT NO.	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	SPECIFICATION
73 74 75					REF	REF
61,63 69,65					REF	REF
400891				5300 BASIC	REF	REF
				5400 BASIC	REF	REF

LIST OF MATERIALS OR PARTS LIST

NEXT ASSY	USED ON	NEXT ASSY/FINAL ASSY
APPLICATION		QTY REQD

SYMBOLS: APPLICABLE TO DANA LABORATORIES INC. ONLY — SA.. SUB- ASSY — MRA.. MAJOR REPL ASSY — MA.. MODULE ASSY — CA..... COMPLETE ASSY

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON DECIMALS X ± .020, XX ± .010, XXX ± .005
ANGLES ± 0° 30'

MATERIAL

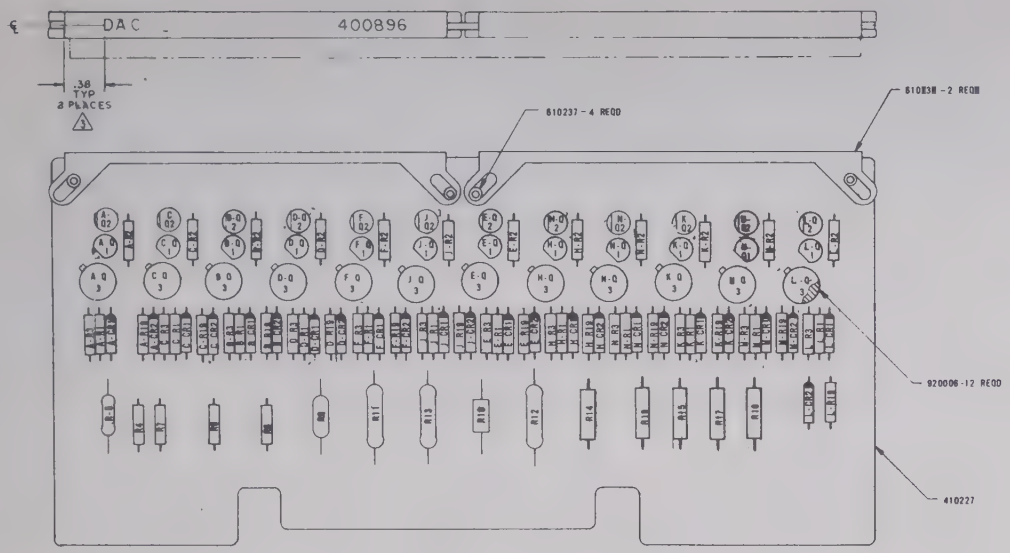
APPLIED FINISH

DRAWN — CHECK — ENGR — APPR — APPROVED

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

SCHEMATIC - DECADE, BCD BASIC

CODE IDENT NO. 21793 | SIZE D | 430390 D | SCALE — | WEIGHT — | SHEET 1 OF 1



REF DES OR ITEM	P/N	DESCRIPTION	QTY
CR1	211003	018	24
CR2	211003	018	REF
Q1	200043	2N3565	12
Q2	200005	TRANS-LO ORDER-YEL	12
Q3	200007	018	12
R1	000473	47k	12
R2	000153	15k	12
R3	000753	75k	12
R4	000204	200k	2
R5	010033	49.9k 1%	1
R6	000104	100k	2
R7	000104	100k	REF
R8	000204	200k	REF
R9	010290	100k 1%	1
R10	020070	50k 1%	1
R11	010291	100k .2%	2
R12	010291	100k .2%	REF
R13	010292	200k .2%	1
R14	020121	100k 1%	1
R15	021103	50k .05%	1
R16	020242	100k .05%	2
R17	020242	100k .05%	REF
R18	020243	200k .05%	1
R19	000203	20k	12
	410227	PCB-DIGITAL ANALOG	1
	[redacted]		
	610237	PIN - SPR	4
	920008	TRANS PAD-LARGE	12
	920010	SOLDER-BAR	A/R

4. ASSEMBLY PROCEDURES AND PROCESSES TO CONFORM TO DANA WORKMANSHIP STANDARDS

3 MEAT STAMP .10 HIGH BLACK CHARACTERS LOCATED AS SHOWN

2 SCHEMATIC REFERENCE: 430370

1 ALL RESISTORS 1/8 W, 5%, CARBON,

NOTES: UNLESS OTHERWISE SPECIFIED

CONTRACT NO.

NAME	DATE
DR R WOOD	9/9/66
CHK	10/3/66
APPD	
PROJ ENG	

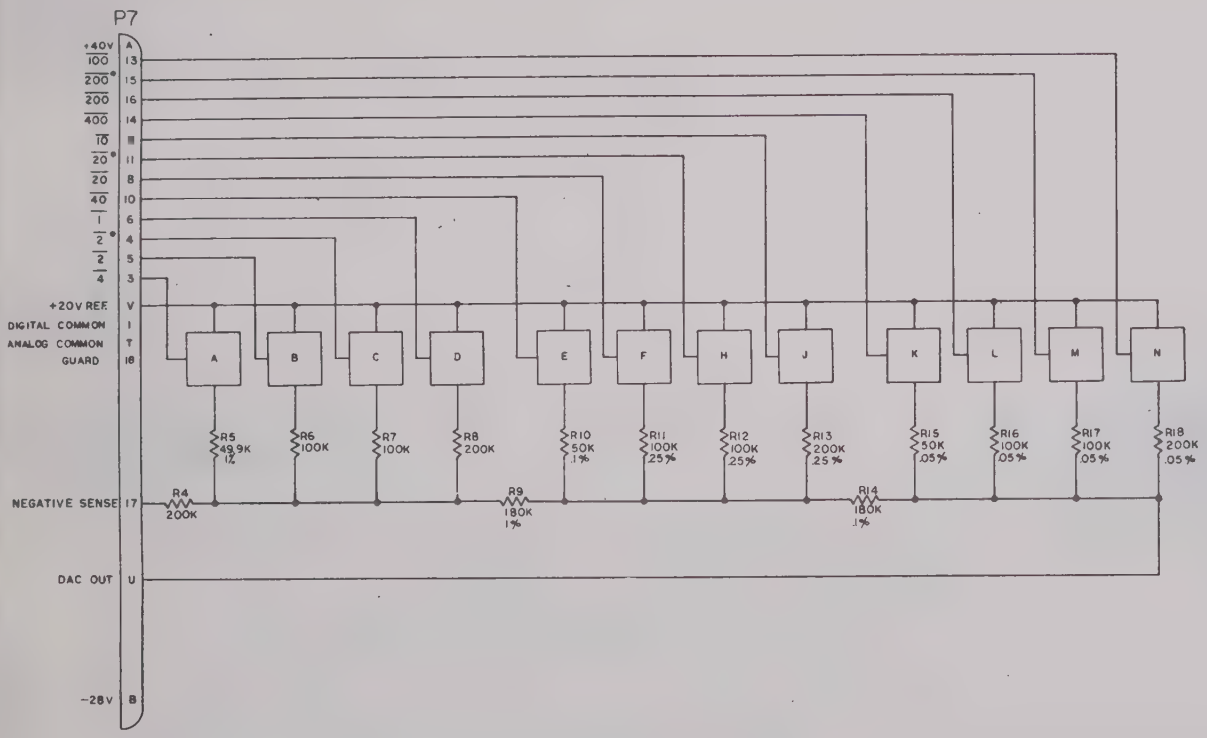
DRW # 629

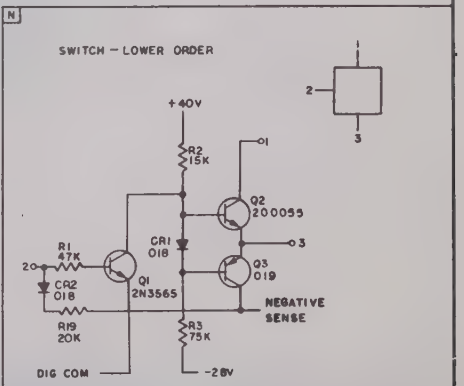
DANA LABORATORIES INC.
IRVINE, CALIFORNIA

P.C. BOARD ASSY — D A C

SIZE	CODE IDENT NO.	DWG NO.
D	21793	400896 , D

SCALE 2:1 | WT | SHEET 1 OF 1





QTY REQD	SYM	ITEM NO.	GOVT OR VENDOR NO.	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION

LIST OF MATERIAL OR PARTS LIST

100BM16	5500	HIT	P.C.F.
NEXT ASSY	USED ON	MA	PA
APPLICATION		QTY REQD	

MATERIAL
APPLIED FINISH
HEAT TREATMENT

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON DECIMALS: X ± .030, XX ± .010, XXX ± .010; ANGLES ± 0° 30'
FORMED ANGLES ± 1.0°
ECCENTRICITY BETWEEN DIA ON THE SAME AXIS SHALL NOT EXCEED .010 TIR.
INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS MIL-D-1000 AND MIL-D-70327

CONTRACT NO.

	NAME	DATE
DR	A. CHAUSSEE	5-5-66
CHK		
APPD		

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

SCHEMATIC – D.A.C.

SIZE	CODE IDENT NO.	DWG NO.
D		430376 A

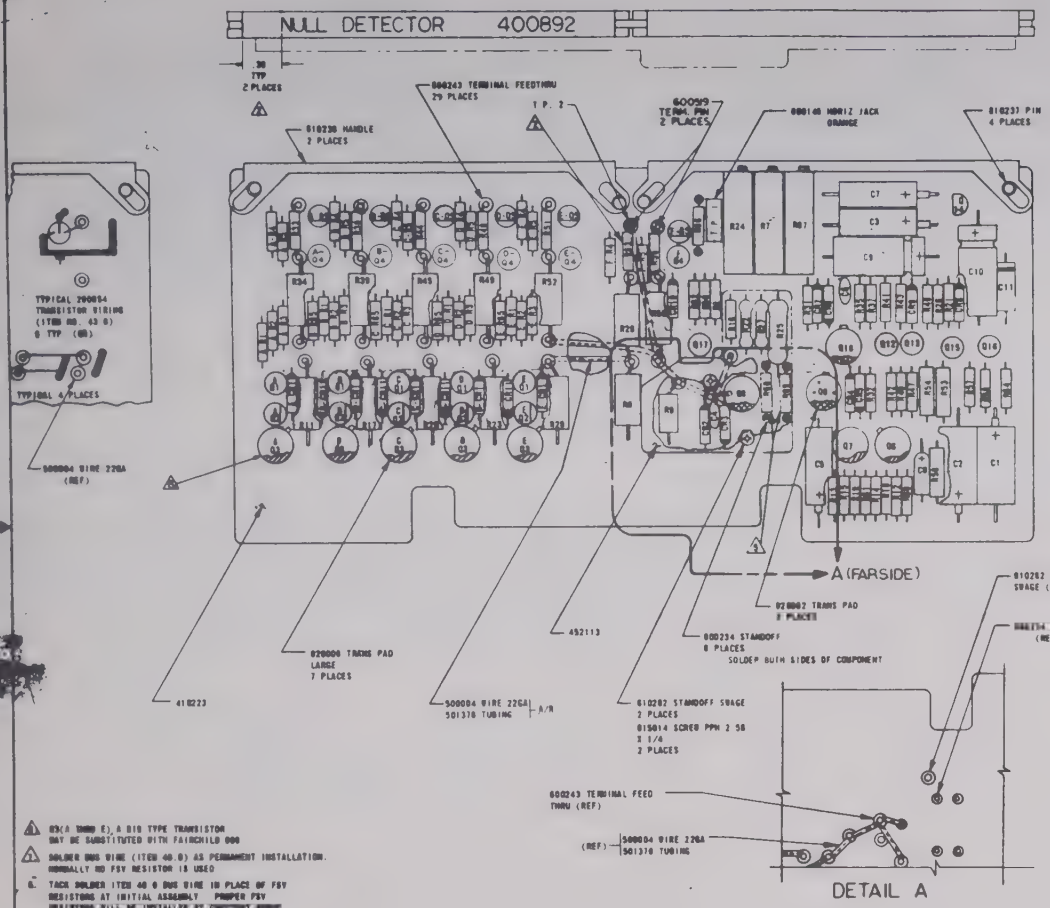
SCALE — WT SHEET 1 OF 1

NOTES: UNLESS OTHERWISE SPECIFIED

2. Highest numbered reference designators: CR2-D3-R19.

1. All resistors to be 1/4W, CARBON FILM.

NULL DETECTOR 400892


.38 TYP 2 PLACES
600243 TERMINAL FEEDTHRU 29 PLACES
T P. 2
600959 TERM. PIN 2 PLACES
610238 HANDLE 2 PLACES
610233 PIN 4 PLACES
TYPICAL 2N6054 TRANSISTOR WIRING (ITEM NO. 43 0) 6 TYP (QB)
TYPICAL 4 PLACES
500004 WIRE 22GA (REF)
A (FARSIDE)
020282 STANDOFF SPACE (REF)
020002 TRANS PAD 2 PLACES
452113
600234 STANDOFF 8 PLACES
SOLDER BOTH SIDES OF COMPONENT
020006 TRANS PAD LARGE 7 PLACES
410223
500004 WIRE 22GA 501370 TUBING A/R
610282 STANDOFF SPACE 2 PLACES
015014 SCREW PPN 2-56 X 1/4 2 PLACES
600243 TERMINAL FEED THRU (REF)
500004 WIRE 22GA 501370 TUBING
DETAIL A

REF DES OR ITEM	P/N	DESCRIPTION	QTY
C1	110047	CAP 50MF,25V	2
C2	110047	CAP 50MF/25V	REF
C3	110043	CAP 25MFD 25V	3
C4	101175	220 PF DISC	1
C5	110043	CAP-25MFD 25V	REF
C6	101642	150 PF DISC	1
C7	110043	CAP 25MFD 25V	REF
C8	110017	10MF/35V DC	1
C9	111007	50 MFD 50V	2
C10	111007	50 MFD 50V	REF
C11	121002	.0022 MF/100V	1
CR1	211003	DIODE-D10	16
CR2	Z10010	DIODE-GE 5322	2
CR3	Z10010	DIODE GE 5322	REF
CR4	211003	DIODE-D10	REF
CR5	211003	DIODE-D10	REF
CR6	211003	DIODE D10	REF
CR7	211003	DIODE-D10	REF
CR8	211003	DIODE-D10	REF
CR9	211003	DIODE-D10	REF
CR10	220004	1N5818	1
CR11	211003	DIODE-D10	REF
Q1	200043	[illegible]	14
Q2	200004	TRANS	11
Q3	200007	TRANS Q10	9
Q4	200043	[illegible]	REF
Q5	200004	TRANS	REF
Q6	200043	[illegible]	1
Q7	200035	TRANS Q14	1
Q8	200011	Q09	1
Q9	200038	TRANS Q15	1
Q10	200048	TRANS Q16	2
Q12	200037	TRANS 2N3646	2
Q13	200037	[illegible]	REF
Q14	200022	TRANS Q12	1
Q15	200043	[illegible]	REF
Q16	200043	TRANS 2N3565	REF
Q17	200043	[illegible]	REF
Q18	200048	TRANS Q16	REF
R1	000473	47K 1/4W	12
R2	000123	12K 1/4W	8
R3	000563	56K 1/4W	5
R4	000473	47K 1/4W	REF
R5	000283	28K 1/4W	6
R6	000273	27K 1/4W	1
R7	040004	100K	1
R8	020244	RES 100K SET	1
R9	020244-6	10K 0.01% SET	1
R11	C20244	99 995K SET 01	REF
R12	000102	1K 1/4W	5
R13	000102	[illegible]	REF
R14	000102	[illegible]	REF
R15	000182	1K 1/4W	REF
R16	000010	51 OHM	1
R17	020244	99 995K SET 01	REF
R18	000201	200 OHM 1/4W	3
R19	000201	200 OHM 1/4W	[illegible]
R20	020244	99 995K SET	REF
R21	000022	0 2K 1/4W	1
R22	010022	3004 1% SET	REF
R23	020244	RES SET 99 995K 01	REF
R24	000005	10K POT	1
R25	010200	RES 2 MEG 1%	1
R26	000123	12K 1/4W	REF
R27	010107	[illegible]	1
R28	020244	RES SET 100 995 01%	REF
R29	020244	RES SET 100K .01%	REF
R30	000104	100K 1/4W	[illegible]
R31	000184	180K 1/4W	2
R32	000114	110K 1/4W	1
R33	001711	FSV 1/4W 5%	10
R34	020244	RES SET 100 995K 01%	REF
R35	000104	100K 1/4W	[illegible]
R37	000331	330 OHM 1/4W	1
R38	001711	FSV 1/4W 5%	[illegible]
R39	020244	RES SET 99 995K 0.01 %	[illegible]
R40	000102	1K 1/4W	[illegible]
R41	000512	5 1K 1/4W	2
R42	000273	27K 1/4W	1
R43	000512	5 1K 1/4W	2
R44	001711	FSV 1 4W	REF
R45	020244	99 995K 01% RES SET	REF
R46	000122	1.2K 1/4W	1
R47	000105	1M	1
R48	001711	FSV 1/4W	REF
R49	020244	RES SET 99.980K 1%	REF
R50	001002	4.7K 1/2W	2
R51	001711	FSV 1/4W 5%	REF
R52	072044	99 995K 01%	REF
R53	001205	5.1K 1/2W	1
R54	001402	4.7K 1/2W	[illegible]
R55	001711	FSV 1/4W 5%	[illegible]
R56	020244	100 995K 01	[illegible]
R57	000303	30K 1/4W	1
R58	000124	120K 1/4W	1
R59	000302	3 0K 1/4W	1
R60	000101	100 OHM 1/4W	2
R61	000101	[illegible]	[illegible]
R62	000201	[illegible]	[illegible]
R63	001711	FSV 1/4W 5%	[illegible]
R64	000473	47K 1/4W	12
R65	000133	13K 1/4W	4
R66	001711	FSV 1/4W 5%	[illegible]
R67	040001	[illegible]	1
R68	001711	[illegible]	[illegible]
R69	001711	FSV 1/4W 5%	[illegible]
R70	000002	0 0R 1 4W	1
	410223	[illegible]	1
	430079	[illegible]	[illegible]
	452230	[illegible]	1
	000010	[illegible]	[illegible]
	500004	WIRE 22GA	A/R
	501370	TUBING	A/R
	000146	[illegible]	1
	600243	TERMINAL FEED-THRU	29
	600919	TERMINAL PIN	2
	610234	STANDOFF	8
	610238	HANDLE	2
	610237	PIN	4
	610282	STANDOFF, SPA	2
	015014	SCREW PPN 2-56 X 1/4	2
	020006	TRANS PAD-LARGE	7
	020010	SOLDER	A/R
	020020	SOLDER-WIRE	A/R
	[illegible]	[illegible]	[illegible]

1. 03(A THRU E), A D10 TYPE TRANSISTOR MAY BE SUBSTITUTED WITH FAIRCHILD 000
2. SOLDER BUS WIRE (ITEM 40 0) AS PERMANENT INSTALLATION. NORMALLY NO FSV RESISTOR IS USED
3. TACK SOLDER ITEM 40 0 BUS WIRE ID PLACE OF FSV RESISTORS AT INITIAL ASSEMBLY PROPER FSV RESISTORS WILL BE INSTALLED BY [illegible]
4. FSV 005 OR R 005 SELECTED AS NECESSARY TO ZERO T C.
5. ASSEMBLY PROCEDURES AND PROCESSES TO CONFORM TO DANA [illegible] STANDARDS
6. SCHEMATIC REFERENCE 430370
7. HEAT STAMP .10 SIGN BLACK CHARACTERS LOCATED AS SHOWN
8. ALL RESISTORS TO BE 1/4 5% CARBON.

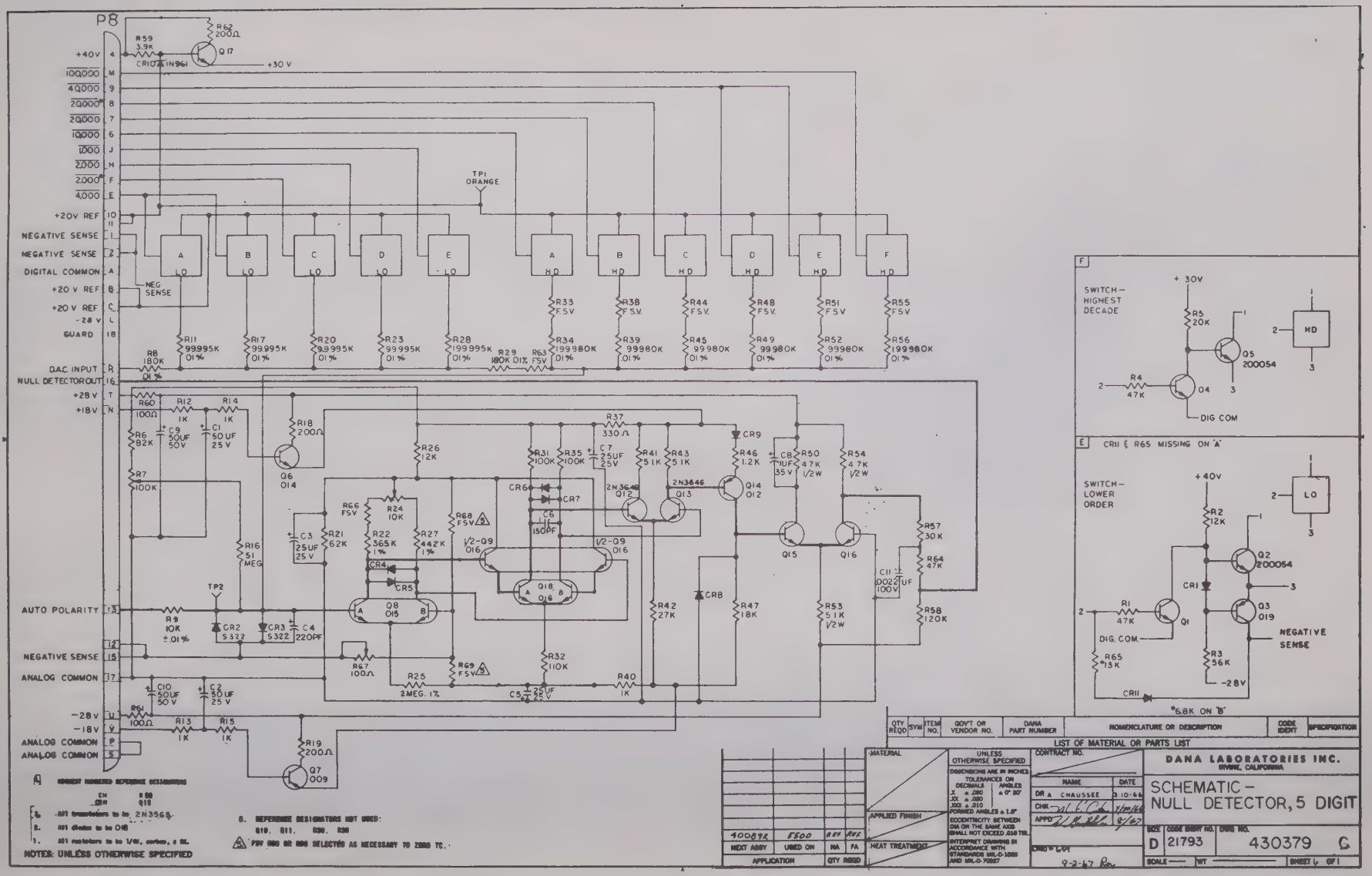
UNLESS OTHERWISE SPECIFIED

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

P.C.BD ASSY -
NULL DETECTOR, 5 DIGIT

SIZE	CODE IDENT NO.	DWG NO.	REV
D	21793	400892	L

SCALE 2/1 WT SHEET 1 OF 1



QTY REQD	SYM	ITEM NO.	GOV'T OR VENDOR NO.	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION

LIST OF MATERIAL OR PARTS LIST

NEXT ASSY	USED ON	RFF	RFF
400098	5500		
APPLICATION		QTY REQD	

MATERIAL
APPLIED FINISH
HEAT TREATMENT

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON DECIMALS: X ± .080, XX ± .030, XXX ± .010
ANGLES ± 0° 30'
FORMED ANGLES ± 1.0°
ECCENTRICITY BETWEEN DIA ON THE SAME AXIS SHALL NOT EXCEED .010 TIR.
INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS MIL-D-1000 AND MIL-D-70327

CONTRACT NO.

	NAME	DATE
DR	A CHAUSSEE	3-10-66
CHK		1/20/66
APPD		9/67

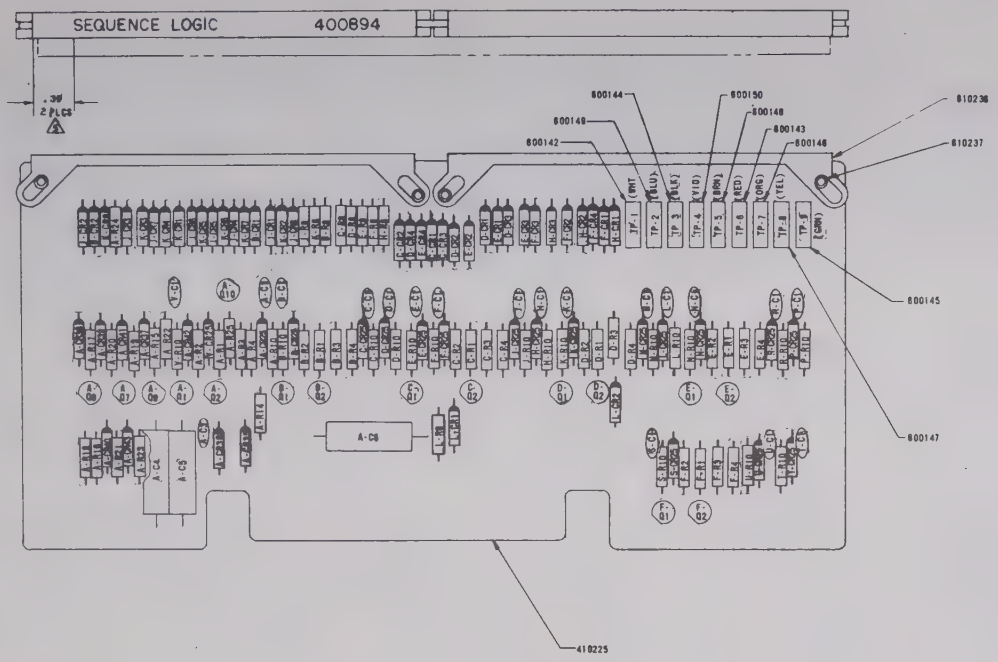
DWG = L-01
9-2-67 Rev

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

SCHEMATIC – NULL DETECTOR, 5 DIGIT

SIZE	CODE IDENT NO.	DWG NO.
D	21793	430379 G

SCALE —— WT —— SHEET 1 OF 1



⚠ HEAT STAMP .10 HIGH BLACK CHARACTERS LOCATED AS SHOWN

4. SCHEMATIC REFERENCE: #430393
3. ASSEMBLY PROCEDURES AND PROCESSES TO CONFORM WITH DANA WORKMANSHIP STANDARDS
2. ALL DIODES TO BE 018
1. ALL RESISTORS TO BE ¼ W ± 5%, CARBON

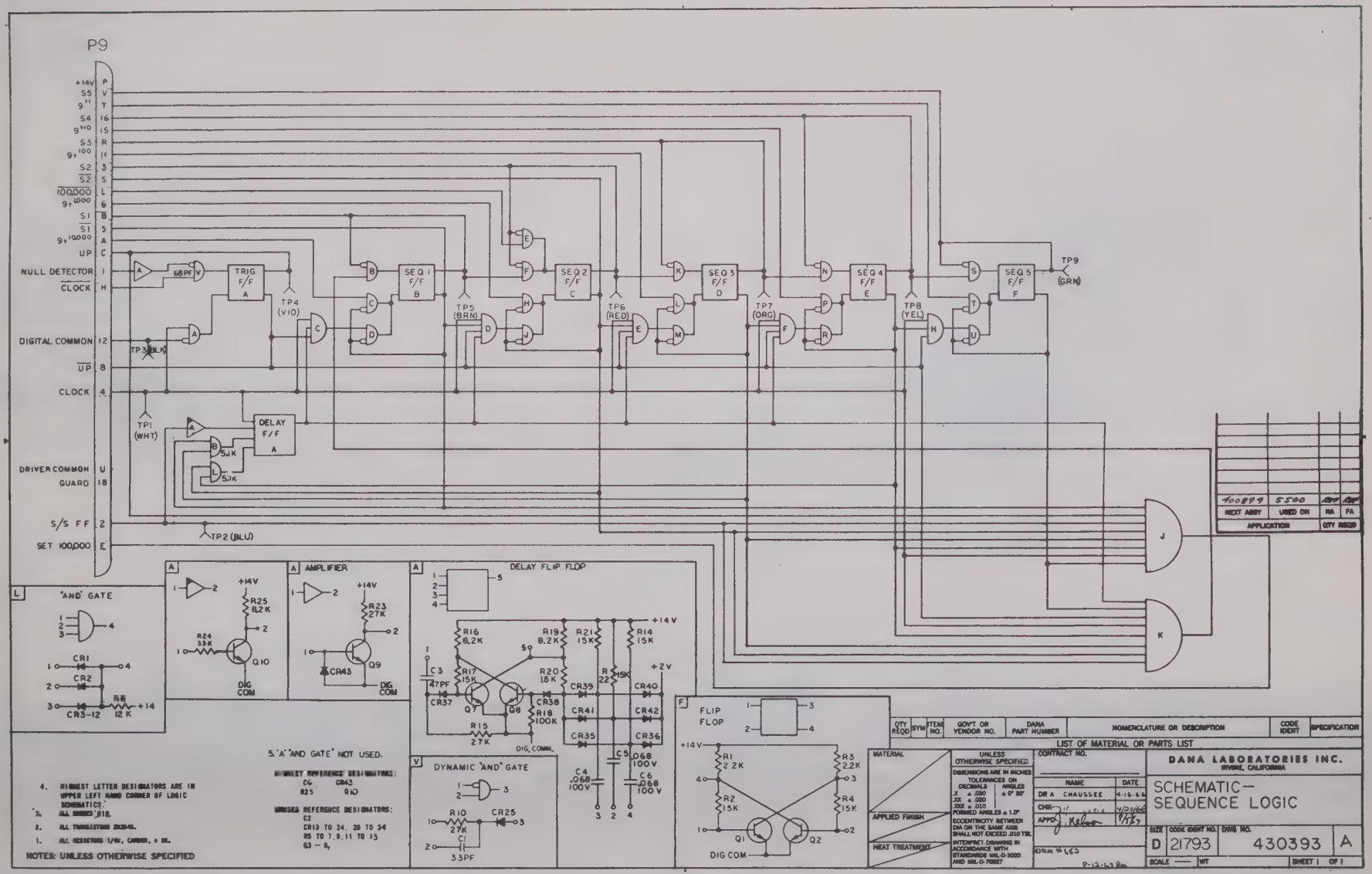
NOTE: UNLESS OTHERWISE SPECIFIED

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

P C BOARD — SEQUENCE LOGIC

SIZE	CODE IDENT NO.	DWG NO.	REV
D	21793	400894	C

SCALE 2/1 | WT. ———— | SHEET 1 OF 3



4. HIGHEST LETTER DESIGNATORS ARE IN UPPER LEFT HAND CORNER OF LOGIC SCHEMATICS.
3. ALL DIODES 918.
2. ALL TRANSISTORS 2N34-48.
1. ALL RESISTORS 1/4W, CARBON, ± 5%.

NOTES: UNLESS OTHERWISE SPECIFIED

5. "A" "AND GATE" NOT USED.

HIGHEST REFERENCE DESIGNATORS:
C6 CR43
R25 Q10

UNUSED REFERENCE DESIGNATORS:
C2
CR13 TO 24, 28 TO 34
R5 TO 7, 9, 11 TO 13
Q3 – 8,

QTY REQD	SYM	ITEM NO.	GOVT OR VENDOR NO.	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION
400899		5500					
NEXT ASSY		USED ON				NA	FA
APPLICATION						QTY REQD	

LIST OF MATERIAL OR PARTS LIST

MATERIAL
APPLIED FINISH
HEAT TREATMENT

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON DECIMALS: X ± .030, XX ± .020, XXX ± .010
FORMED ANGLES ± 1.0°
ANGLES ± 0° 30'
ECCENTRICITY BETWEEN DIA OR THE SAME AXIS SHALL NOT EXCEED .010 TIR.
INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS MIL-D-1000 AND MIL-D-70327

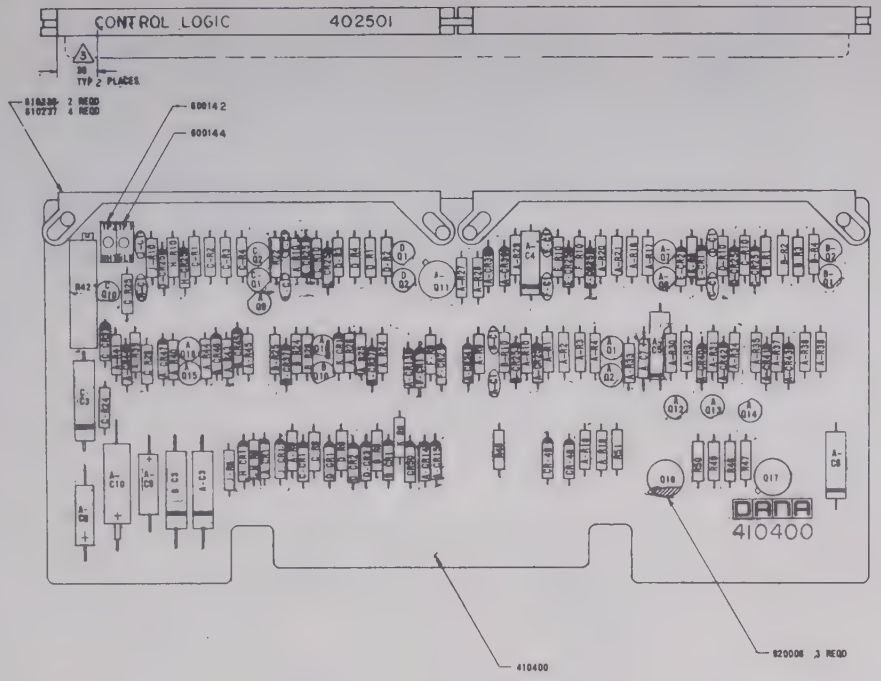
CONTRACT NO.

	NAME	DATE
DR	A CHAUSSEE	4-16-66
CHK		4/23/66
APPD		5/1/67

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

SCHEMATIC—
SEQUENCE LOGIC

SIZE	CODE IDENT NO.	DWG NO.	
D	21793	430393	A
SCALE —	WT	SHEET 1 OF 1	



REF DES OR ITEM	P/N	DESCRIPTION	QTY
C1	100012	33 PF DISC	7
A-C1	101102	47 PF DISC	2
B-C1	101102	47 PF DISC	REF
E-C1	101146	100 PF DISC	1
C3	121003	.047 UF/100V	3
C4	121473	.0015 UF/100V	2
C5	121473	.0015 UF/100V	REF
C6	121000	.015 UF/100V	1
C7	110017	1 UF/35V	1
C8	110001	6.8 UF/35V	2
C9	110001	6.8 UF/35V	REF
C10	110043	25 UF/25V	1
Q1	200037	2N3646	10
Q2			REF
Q7			
Q8			
Q9			
Q10	200037	2N3646	REF
Q11	200011	000	1
Q12	200037	2N3646	REF
Q13			
Q14			
Q15	200037	2N3646	REF
Q16	200037	2N3646	REF
Q17	200159	TRANS 18-VOLT	2
Q18	200159	TRANS 18-VOLT	REF

REF DES OR ITEM	P/N	DESCRIPTION	QTY
R1	000222	2.2k	10
R2	000153	15k	15
R3	000232	2.2k	REF
R4	000153	15k	REF
R5	000123	12k	8
R6	000432	4.3k	1
R9	000204	200k	1
R10	000273	27k	11
R16	000122	1.2k	4
R17	000153	15k	1
R18	000022	0.2k	8
R19	000022	0.2k	REF
R20	000122	1.2k	REF
R21	000153	15k	REF
R22	000201	200 OHM	1
R24	000153	15k	REF
R25	000104	100k	7
R26	000022	0.2k	REF
R27	000022	0.2k	1
R28	000153	15k	REF
R29	000242	2.4k	1
R30	000153	15k	REF
R31	000104	100k	REF
R32	000122	1.2k	REF
R33	000231	220 OHMS	1
R34	000203	20k	2
R35	000203	20k	REF

REF DES OR ITEM	P/N	DESCRIPTION	QTY
R36	000122	1.2k	REF
R37	000104	100k	REF
R38	000752	7.5k	1
R39	000104	100k	REF
R40	000222	2.2k	REF
R41	000133	13k	1
R42	040003	20k POT	1
R43	000222	2.2k	REF
R44	000104	100k	REF
R45	000243	24k	1
R46	000022	0.2k	REF
R47	000103	10k	4
R48	〃	〃	〃
R49	〃	〃	〃
R50	000103	10k	REF
RS1	000273	27k	REF
	410400	PCB CONTROL LOGIC	1
	430005	SCHEMATIC CONTROL LOGIC	REF
	000142	HORIZ JACK WHITE	1
	000144	HORIZ JACK BLACK	1
	810236	HANDLE-EXTRACTOR	2
	810237	PIN-SPRING	4
	920006	TRANS PAD-LARGE	.5
	920010	SOLDER-63/37 BAR	A/R

3. ALL 810005 ARE 010 P/N 211003 QUANTITY 40
4. ASSEMBLY PROCEDURES AND PROCESSES TO CONFORM TO DANA WORKMANSHIP STANDARDS

⚠1. HEAT STAMP .10 HIGH BLACK CHARACTERS [illegible]

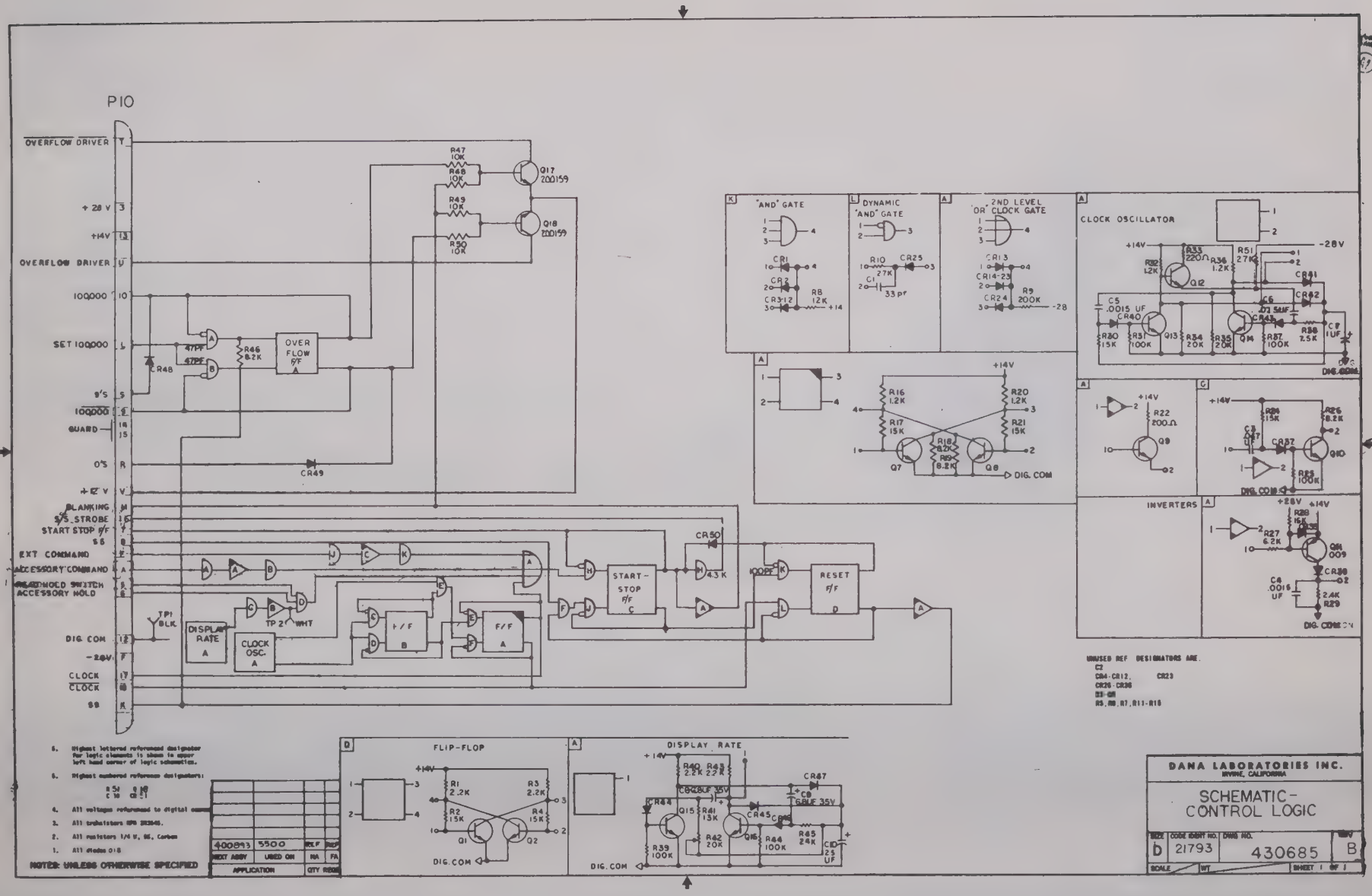
2. SCHEMATIC REFERENCE: 430005
1. ALL RESISTORS TO BE 1/8 1%, CARBON

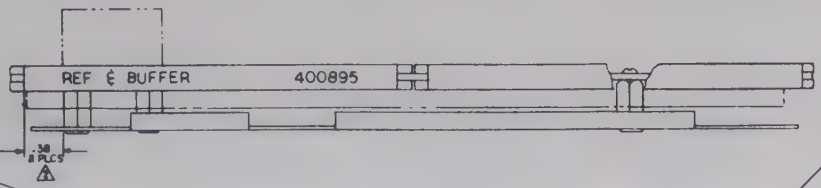
NOTES: UNLESS OTHERWISE SPECIFIED

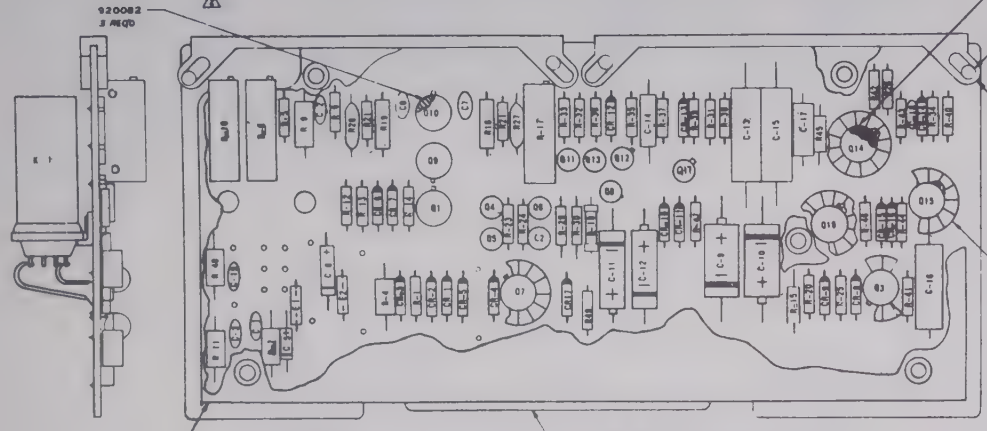
DANA LABORATORIES INC.
IRVINE, CALIFORNIA

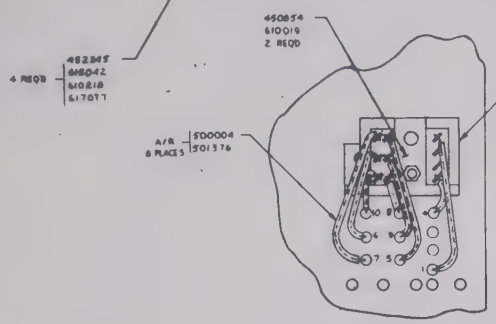
P.C.B. ASSY - CONTROL LOGIC

SIZE	CODE IDENT NO.	DWG NO.	
D	21793	402501	H
SCALE 2/1	WT	SHEET 1 OF 1	


P10
OVERFLOW DRIVER
+28 V
+14V
OVERFLOW DRIVER
100,000
SET 100,000
9's
100,000
GUARD
0's
+12 V
BLANKING
S/S STROBE
START STOP F/F
SS
EXT COMMAND
ACCESSORY COMMAND
HEADWHOLD SWITCH
ACCESSORY HOLD
DIG COM
-28V
CLOCK
CLOCK
SS
R47 10K
R48 10K
Q17 2N0159
R49 10K
Q18 2N0159
R50 10K
CR48
CR49
R46 8.2K
OVER FLOW F/F A
DISPLAY RATE A
CLOCK OSC. A
TP1 BLK
TP2 WHT
1 F/F B
F/F A
START-STOP F/F C
RESET F/F D
CR50
4.3K
100PF
"AND" GATE
DYNAMIC "AND" GATE
2ND LEVEL OR CLOCK GATE
CR1
CR2
CR3-12
R8 12K
R10 27K
C1 33pf
CR25
CR13
CR14-23
CR24
R9 200K
CLOCK OSCILLATOR
R32 1.2K
R33 220Ω
R36 1.2K
R51 27K
Q12
CR41
CR42
C5 .0015 UF
CR40
C6 .01 5KUF
CR43
R30 15K
R31 100K
Q13
R34 20K
R35 20K
Q14
R37 100K
R38 7.5K
C7 1UF
DIG. COM
+14V
R16 1.2K
R17 15K
R18 8.2K
R19 8.2K
R20 1.2K
R21 15K
Q7
Q8
DIG. COM
R22 200Ω
Q9
R24 15K
R25 8.2K
C3 .047
CR37
Q10
R23 100K
DIG. COM
INVERTERS
+28V
+14V
R28 15K
R27 6.2K
Q11
Q09
CR38
C4 .0015 UF
2.4K R29
DIG. COM
UNUSED REF DESIGNATORS ARE.
C2
CR4-CR12, CR23
CR26-CR36
D3-D8
R5, R8, R7, R11-R18
FLIP-FLOP
R1 2.2K
R3 2.2K
R2 15K
R4 15K
Q1
Q2
DIG. COM
DISPLAY RATE
+14V
R40 2.2K
R43 2.2K
CR47
C8 25UF 35V
CR44
Q15
R41 13K
CR45
CR46
R39 100K
R42 20K
Q16
R44 100K
R45 24K
C10 25 UF
DIG. COM
NOTES: UNLESS OTHERWISE SPECIFIED
1. All diodes 018
2. All resistors 1/4 W, 5%, Carbon
3. All transistors EPR 2N3646.
4. All voltages referenced to digital comm
5. Highest numbered reference designators:
6. Highest lettered reference designator for logic elements is shown in upper left hand corner of logic schematics.
400893 5500
NEXT ASSY USED ON
APPLICATION
REF
NA
QTY REQD
DANA LABORATORIES INC.
IRVINE, CALIFORNIA
SCHEMATIC - CONTROL LOGIC
SIZE b
CODE IDENT NO. 21793
DWG NO. 430685
REV B
SCALE
WT
SHEET 1 OF 1







REF DES OR ITEM	P/N	DESCRIPTION	QTY
C1	101145	100 PF DISC	3
C2	101145	100 PF DISC	REF
C3	101842	150 PF DISC	2
C5	110017	1 UF 35V	1
C6	110001	8 8 UF 35V	1
C7	101641	470 PF	2
C8	101641	470 PF	REF
C9	110036	25 UF 50V	2
C10	110036	25 UF 50V	REF
C11	110038	50 UF 15V	2
C12	110038	50 UF 15V	REF
C13	110007	6 UF 25V	2
C14	120001	.0033 UF 1400V	1
C15	110007	6 UF 25V	REF
C16	121083	.047 UF 100V	1
C17	121008	.01 UF 100V	1
C18	101145	100 PF DISC	REF
C19	101842	150 PF DISC	REF
CR1	220007	1N751	1
CR2	211236	D07	1
CR3	402378	FSV ZENER	1
CR4	211003	D18	11
CR5	211003	D18	REF
CR6	211003	D18	REF
CR7	211003	D18	REF
CR8	211003	D18	REF
CR9	211003	D18	REF
CR10	220012	1N9588	1

REF DES OR ITEM	P/N	DESCRIPTION	QTY
CR11	220004	1N9618	1
CR12	211003	D18	REF
CR13	211003	D18	REF
CR14	211003	D18	REF
CR15	211003	D18	REF
CR16	211003	D18	REF
CR17	210004	SD4	1
E1	600245	JUMPER INSL	2
E2	600245	JUMPER INSL	REF
K1	310021	RELAY 2 POLE	1
Q1	200036	D15	1
Q2	200043	2N3565	5
Q3	200035	D14	1
Q4	200044	MATCHED PAIR	1
Q5			
Q6	200043	2N3565	REF
Q7	200011	D09	4
Q8	200043	2N3565	REF
Q9	200040	D16	2
Q10	200040	D16	REF
Q11	200043	2N3565	REF
Q12	200022	D12	2
Q13	200043	2N3565	REF
Q14	200011	D09	REF
Q15	200011	D09	REF

REF DES OR ITEM	P/N	DESCRIPTION	QTY
Q16	200011	D09	REF
Q17	200022	D12	REF
R1	000512	5 1K	1
R4	402376	FSV 1%	REF
R5	001750	5 Ω OHMS	1
R6	000126	12 MEG OHMS	1
R7	020123	10k .01%	2
R8	040050	5k POT	1
R9	020123	10k .01%	REF
R10	040003	20k POT	1
R11	402376	FSV .01%	REF
R12	000681	680 OHMS	1
R13	000107	100 MEG	2
R14	000107	100 MEG	REF
R15	001074	680 OHMS 1/2W	1
R16	018145	324k 1%	2
R17	040054	50k POT	1
R18	018091	11k 1%	1
R19	018145	324k 1%	REF
R20	000680	68 OHMS	1
R21	000242	2.4k	2
R22	000242	2.4k	REF
R23	000505	5.6 MEG	1
R24	000335	3.3 MEG	1
R25	000822	8.2k	1
R26	000101	100 OHMS	5
R27	010114	4.02k 1%	2
R28	010114	4.02k 1%	REF
R29	U10299	12k 1%	1
R30	010300	750 OHMS 1%	1
R31	000101	100 OHMS	REF
R32	000181	180 OHMS	1
R33	000101	100 OHMS	REF
R34	000752	7.5k	1
R35	000201	200 OHMS	1
R36	000101	100 OHMS	REF
R37	000151	150 OHMS	1
R38	000101	100 OHMS	REF
R39	000221	220 OHMS	1

REF DES OR ITEM	P/N	DESCRIPTION	QTY
R40	000102	1k	1
R41	000133	13k	1
R42	000150	19 OHMS	3
R43	000220	22 OHMS	1
R44	000150	15 OHMS	REF
R45	001200	3.9k 1/2W	1
R46	000150	15 OHMS	REF
R47	000122	1.2k	1
R48	020350	13.0k .01%	1
R49	000153	15k	1
	410226	PCB REFERENCE & BUFFER	1
	430305	SCHEM-REF & BUFF	A/R
	450854	UNIT RELAY MTR MULTI POLE	1
	452345	SHIELD REF & BUFF	1
	500004	WIRE BUSS	A/R
	501376	TUBING TEFLON	A/R
	600018	HEAT SINK	5
	600221	SOCKET RELAY 2 POLE	1
	600245	JUMPER-INSUL	2
	610019	RIVET-1/8 SEMI-TUB X 9/32 LG	2
	610218	STDOFF-SS 4-40 1/4 HEX X 7/16 LG	4
	610236	HANDLE-EXTRACTOR	2
	610237	PIN-SPRING	4
	615042	SCR PPH 4-40 X 1/4	8
	617004	HEX NUT 4-40 STD	1
	617077	WASH INT LOCK 4	8
	620008	TRANS PAD-LARGE	5
	620018	SOLDER-BAR	A/R
	620028	SOLDER-WIRE	A/R
	620002	TRANS PAD	3

5 ASSEMBLY PROCEDURE & PROCESSES TO COMPLY WITH DANA WORKMANSHIP STANDARDS

4 SCHEMATIC REFERENCE NO 430305

3. DIODES ARE D18

⚠ HEAT STAMP .10 HIGH BLACK CHARACTERS [redacted] LOCATED AS SHOWN

1 RESISTORS TO BE 1/4 W ± 5% CARBON

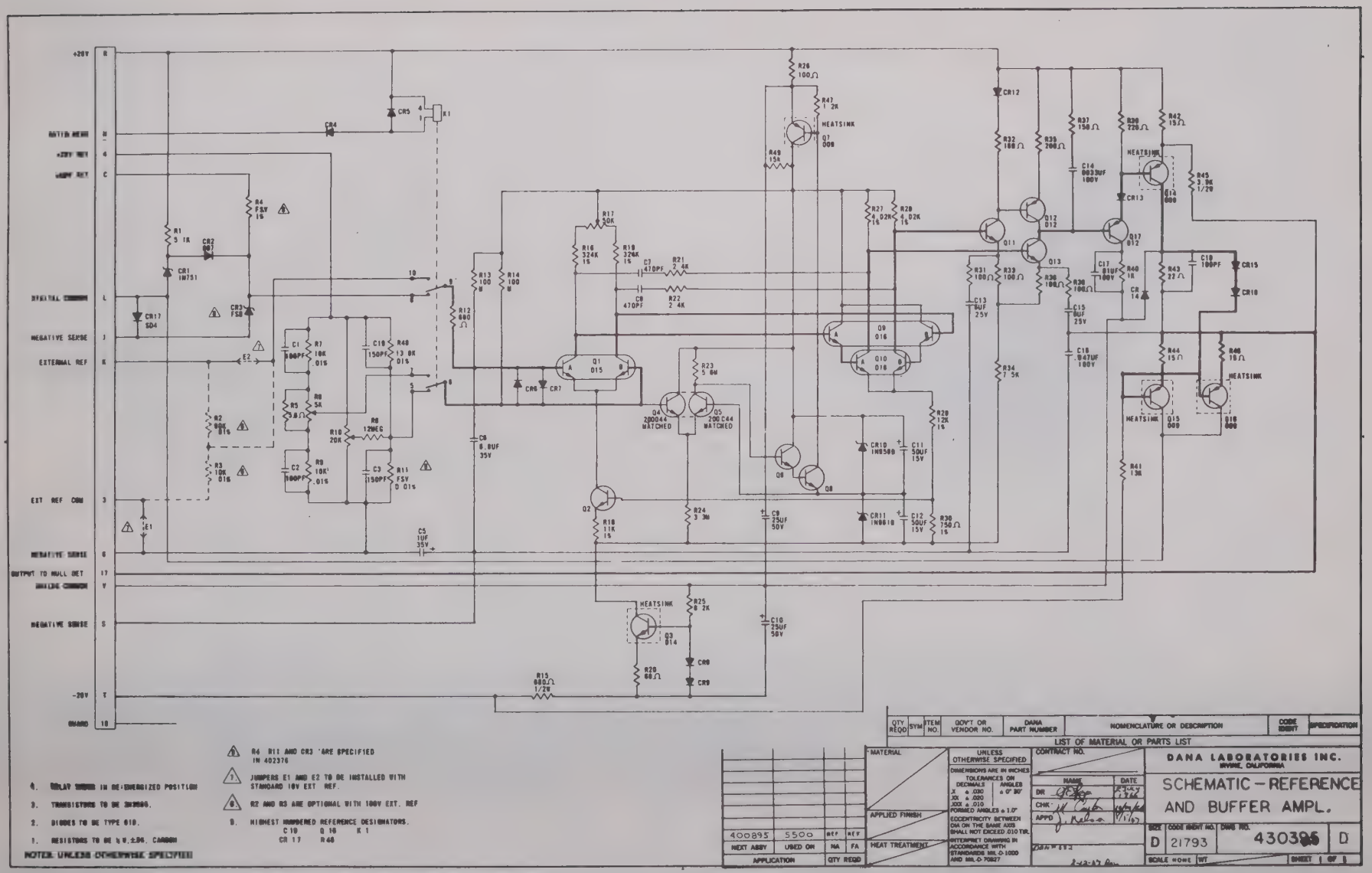
NOTE UNLESS OTHERWISE SPECIFIED

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

P.C.BOARD ASS'Y — REFERENCE & BUFFER

SIZE	CODE IDENT NO	DWG NO.	REV
D	21793	400895	M

SCALE 8/1 WT SHEET 1 OF 1



4. RELAY SHOWN IN DE-ENERGIZED POSITION
3. TRANSISTORS TO BE 2N3996.
2. DIODES TO BE TYPE 610.
1. RESISTORS TO BE ¼ W, ±2%, CARBON

NOTES UNLESS OTHERWISE SPECIFIED

⚠ R4, R11 AND CR3 ARE SPECIFIED IN 402376

⚠ JUMPERS E1 AND E2 TO BE INSTALLED WITH STANDARD 10V EXT REF.

⚠ R2 AND R3 ARE OPTIONAL WITH 100V EXT. REF

D. HIGHEST NUMBERED REFERENCE DESIGNATORS.
C 10 Q 18 K 1
CR 17 R 46

QTY REQD	SYM	ITEM NO.	GOVT OR VENDOR NO.	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION

LIST OF MATERIAL OR PARTS LIST

NEXT ASSY	USED ON	REF	REF
400895	5500		
APPLICATION		QTY REQD	

MATERIAL
APPLIED FINISH
HEAT TREATMENT

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON DECIMALS: X ± .030, .XX ± .020, .XXX ± .010; ANGLES ± 0° 30'
FORMED ANGLES ± 1.0°
ECCENTRICITY BETWEEN DIA ON THE BARE ASSY SHALL NOT EXCEED .010 TIR.
INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS MIL-D-1000 AND MIL-D-70827

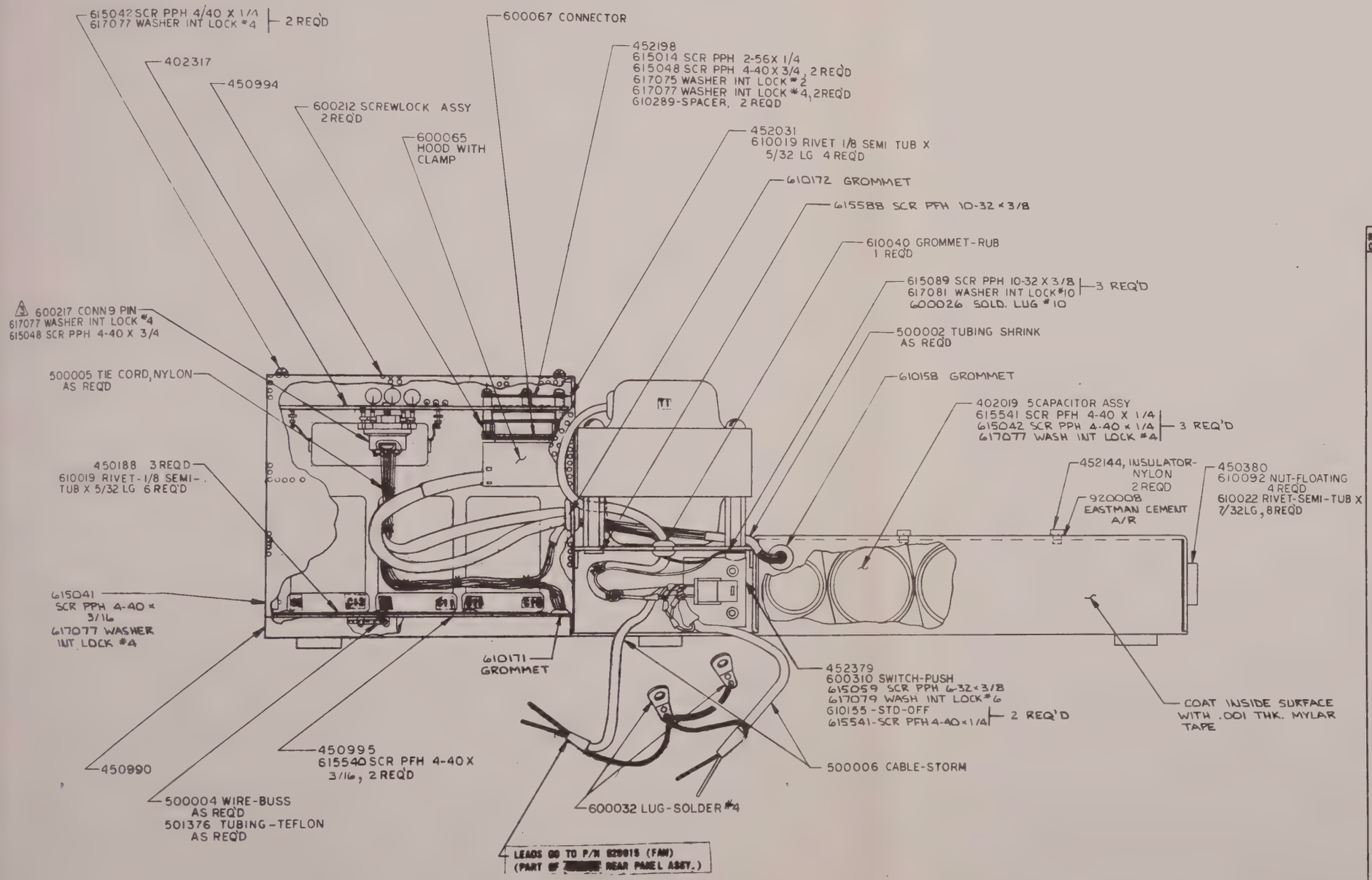
CONTRACT NO.

	NAME	DATE
DR		12-13-67
CHK		12-14-67
APPD		12/15/67

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

SCHEMATIC – REFERENCE AND BUFFER AMPL.

SIZE	CODE IDENT NO.	DWG NO.	
D	21793	430395	D
SCALE NONE	WT	SHEET 1 OF 1	



REF DES OR ITEM	P/N	DESCRIPTION	QTY
C9 C13	110034	1000 UF/35V (DUAL)	3
C8 C11	110034	1000 UF/35V (DUAL)	REF
C15 C19	110034	1000 UF/35V (DUAL)	REF
T1	300017	TRANSFORMER-POWER	1
	402019	CAPACITOR ASSY-5 CAP	1
	402317	PCB ASSY-PWR SUPL	1
	430399	SCHEMATIC-PWR SUPL	A/R
	450188	INSULATOR-CAP	3
	450380	INS-CARD BOX. TOP & BOT	4
	450990	CHASSIS-PWR SUP. WELDED	1
	450991	CHASSIS-PWR SUP MAIN	REF
	450992	HOUSING-3 CAPACITORS	REF
	450994	SHIELD-3 CAPACITORS	1
	450995	BRACKET-3 CAPACITORS	1
	452031	GUIDE-CARD	2
	452198	PLATE-SHIELD. PWR SUPPLY	1
	452379	PLATE MTG PWR SWITCH INSULATED	1
	500002	TUBING-SHRINK	A/R
	500004	WIRE-BUSS	A/R
	500005	TIE CORD NYLON	A/R
	500006	CABLE-STORM	A/R
	501376	TUBING-TEFLON	A/R
	600026	LUG-SOLDER #10	1
	600032	LUG-SOLDER #4	2
	600065	HOOD W/CLAMP	1

REF DES OR ITEM	P/N	DESCRIPTION	QTY
	600067	CONN-DA-15S	1
	600212	SCREWLOCK ASSY	2
	600217	CONN 9 PIN	1
	600310	SWITCH-PUSH	1
	610019	RIVET-1 8 SEMI-TUB X 5/32 LG	10
	610022	RIVET-SEMI-TUB X 7/32 LG, NICKEL	8
	610040	GROMMET-RUB	1
	610092	NUT-FLOATING	4
	610155	STD-OFF	2
	610171	GROMMET-BLK VIN 5 16 00 X 3/16 ID	1
	610172	GROMMET	1
	610158	GROMMET	1
	615014	SCREW PPH 2-56 X 1/4	1
	615041	SCREW PPH 4-40 X 3/16	1
	615042	SCREW PPH 4-40 X 1/4	5
	615048	SCREW PPH 4-40 X 3/4	3
	615059	SCREW PPH 6-32 X 3/8	1
	615089	SCR PPH 10-32 X 3/8	3
	615541	SCREW PFH 4-40 X 1/4	5
	617075	WASHER INT LOCK 2	1
	617077	WASHER INT LOCK 4	9
	617081	WASHER INT LOCK 10	3
	617079	WASHER INT LOCK 6	1
	615588	SCR PFH 10-32 X 3/8	1
	320026	SOLDER-WIRE	A/R
	610289	SPACER	2
	452144	INSUL NYLON	2
	920008	EASTMAN CEMENT	A/R

1. WIRE CONNECTOR TO ALLOW INSTALLATION OF SCREW (P/N 615048).
2. ASSEMBLY PROCEDURES AND PROCESSES TO CONFORM TO DANA WORKMANSHIP STANDARDS.
3. REFERENCE: SCHEMATIC 430399.

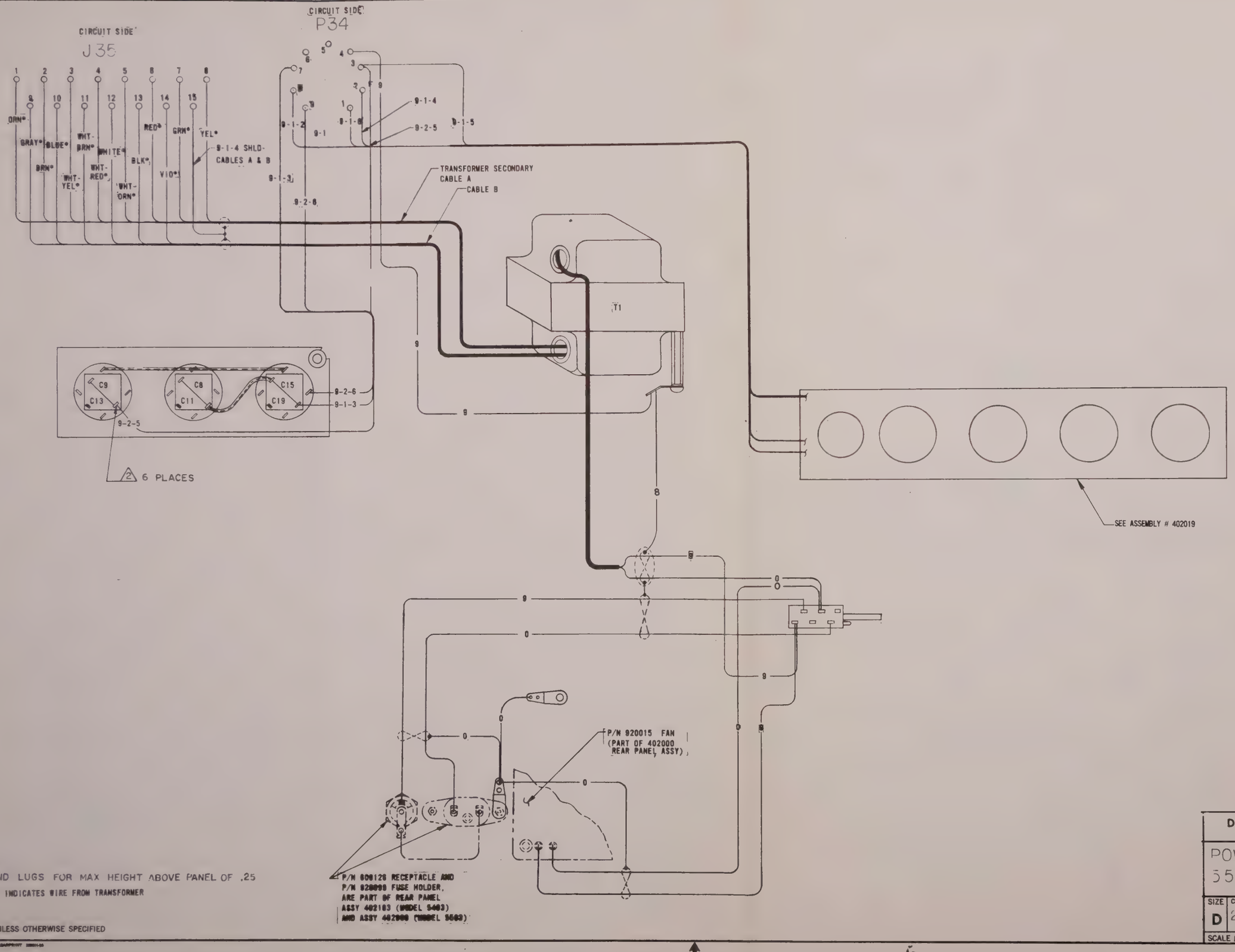
NOTE: UNLESS OTHERWISE SPECIFIED

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

POWER SUPPLY ASSY-
5500 DVM

SIZE	CODE IDENT NO.	DWG NO.	REV
D	21793	402314	M

SCALE 1/1 | WT | SHEET 1 OF 2



REF DES OR ITEM	P/N	DESCRIPTION	QTY
	524000	WIRE- 0 COLOR	A R
	524888	WIRE- 8 COLOR	A R
	524912	WIRE-9-1-2 COLOR	A/R
	524913	WIRE-9-1-3 COLOR	A/R
	524914	WIRE-9-1-4 COLOR	A/R
	524915	WIRE-9-1-5 COLOR	A R
	524916	WIRE-9-1-6 COLOR	A/R
	524917	WIRE-9-1-7 COLOR	A/R
	524919	WIRE-9-1 COLOR	A R
	524924	WIRE-9-2-4 COLOR	A/R
	524925	WIRE-9-2-5 COLOR	A/R
	524926	WIRE-9-2-6 COLOR	A/R
	524999	WIRE-9 COLOR	A/R

2 BEND LUGS FOR MAX HEIGHT ABOVE PANEL OF .25

1. * INDICATES WIRE FROM TRANSFORMER

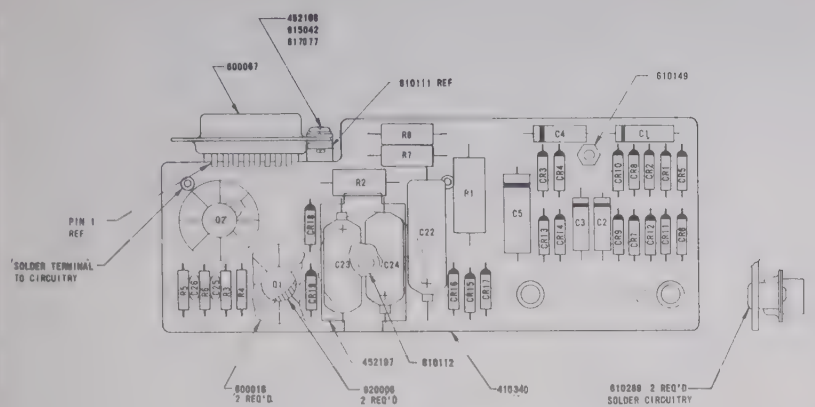
NOTE: UNLESS OTHERWISE SPECIFIED

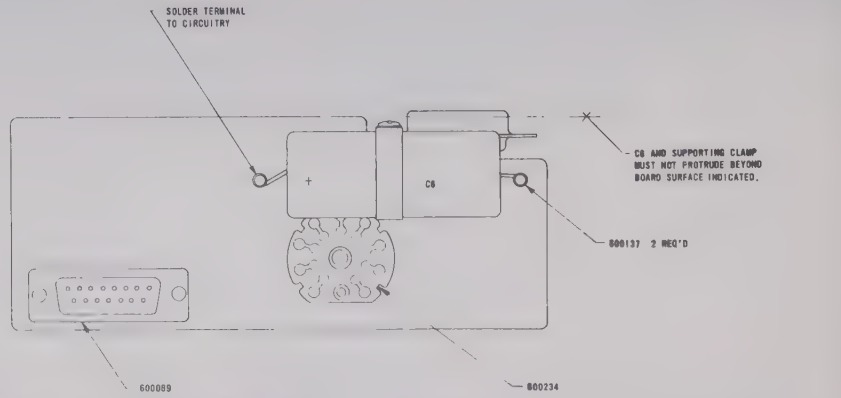
DANA LABORATORIES INC.
IRVINE, CALIFORNIA

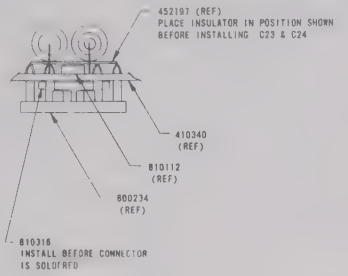
POWER SUPPLY ASSY-
3503 DVM

SIZE	CODE IDENT NO.	DWG NO.	REV
D	21793	402314	M

SCALE NONE | WT | SHEET 2 OF 2







REF DES OR ITEM	P/N	DESCRIPTION	QTY
C1	121088	.01UF, 100V	4
C2	↑	↓	REF
C3	↑	↓	REF
C4	121088	.01UF, 100V	REF
C5	120072	.01UF, 600V	1
C6	110049	500UF, 50V	1
C22	110041	250UF, 6V	1
C23	110036	25UF, 50V	2
C24	110036	25UF, 50V	REF
C25	101174	.001UF, DISC	2
C26	101174	.001UF, DISC	REF
CR1	210004	SD-4	13
CR2	210004	SD-4	REF
CR3	210014	023	4
CR4	210014	023	REF

REF DES OR ITEM	P/N	DESCRIPTION	QTY
CR5	210004	SD-4	REF
↑	↑	↓	↓
CR12	210004	SD-4	REF
CR13	210014	023	REF
CR14	210014	023	REF
CR15	210004	SD-4	REF
↑	↑	↓	↓
CR17	210004	SD-4	REF
CR18	220015	1N967B	2
CR19	220015	1N967B	REF
Q1	200035	014	1
Q2	200011	009	1
R1	031450	220K, 2W	1
R2	030008	200 OHMS, 3W	1

REF DES OR ITEM	P/N	DESCRIPTION	QTY
R3	000202	2K	2
R4	000202	2K	REF
R5	000151	150 OHMS	2
R6	000151	150 OHMS	REF
R7	030007	150 OHMS, 3W	2
R8	030007	150 OHMS, 3W	REF
	410340	PCB-POWER SUP	1
	430399	SCHEMATIC-POWER SUPPLY	REF
	452166	CLAMP-RETAINER, CAPACITOR	1
	452197	INSULATOR-CAPACITOR, PWR SUP	1
	600016	HEAT SINK	2
	600067	CONN-DA-15S	1
	600069	CONN-DA-15P-6	1

P/N	DESCRIPTION	QTY
600137	TERM-UNINSUL	2
600234	CONN-9 SOCKET	1
610111	NUT-PRESS, 4-40	1
610112	NUT-PRESS, SPL, 4-40	1
610149	STANDOFF-SWAGE 2-56	1
610289	SPACER-SWG, .15 I.D. X .19 LG X .06 MTG	2
610316	WASHER-FIBRE .19 X .64 X .06 THK	1
615042	SCREW PPH 4-40 X 1/4	1
617077	WASHER-INT LOCK 4	1
920006	TRANS PAD-LARGE	2
920010	SOLDER-BAR	A/R
920026	SOLDER-WIRE	A/R

QTY REQD	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION OR VENDOR P/N	ITEM NO.
402314	5500	1	1		
NEXT ASSY	USED ON	NA	FA		
APPLICATION		QTY REQD			

LIST OF MATERIAL OR PARTS LIST

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON: DECIMALS X .030, XX .020, XXX .010; ANGLES 0° 30'; FORMED ANGLES 1°

MATERIAL

FINISH

CONTRACT NO.

DRAWN JJ Berg 10-30-66

CHECK [illegible] 1-17-67

DES ENGR [illegible]

PROJ ENGR [illegible]

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

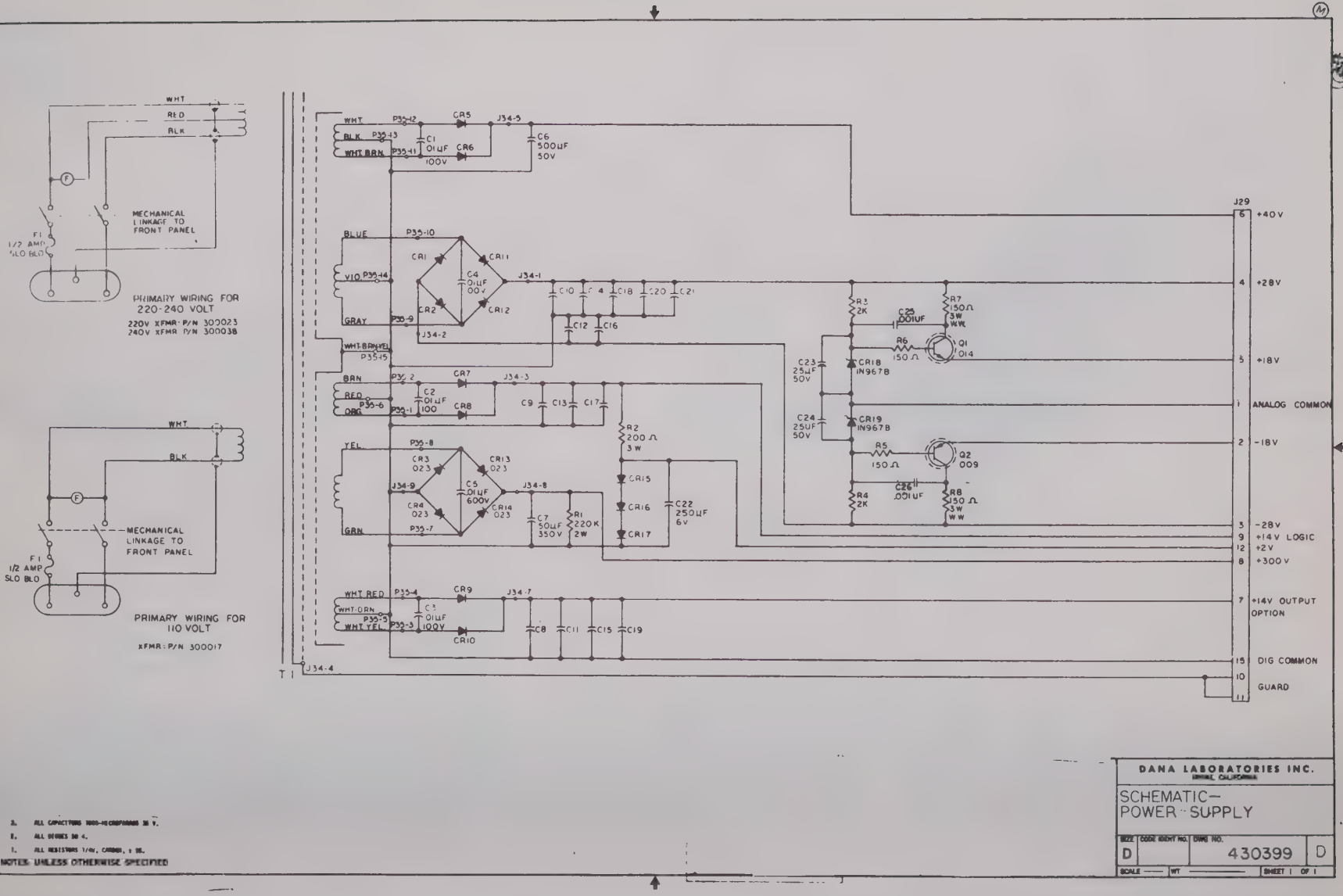
P.C. BOARD ASSY-POWER SUPPLY

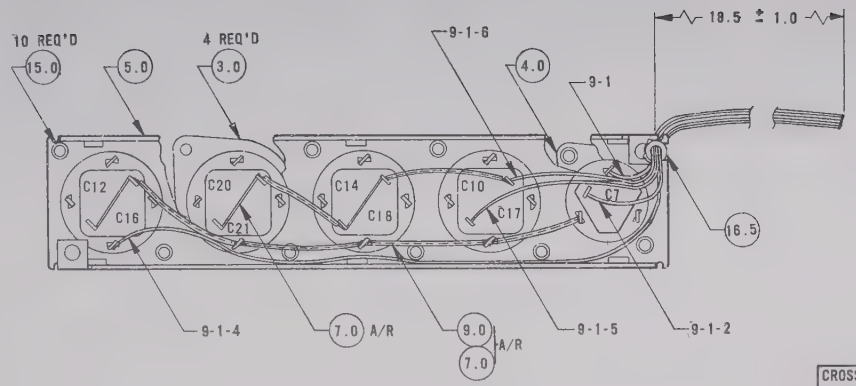
SIZE	CODE IDENT NO.	DWG NO.	REV
D	21793	402317	C

SCALE 2/1 WT SHEET 1 OF 1

1. SCHEMATIC REFERENCE: 430399
2. ASSEMBLY PROCEDURES AND PROCESSES TO CONFORM WITH DANA WORKMANSHIP STANDARDS
3. ALL RESISTORS ARE 1/4 W, ± 5%, CARBON

NOTE: UNLESS OTHERWISE SPECIFIED


WHT
RED
BLK
F1
1/2 AMP
SLO BLO
MECHANICAL LINKAGE TO FRONT PANEL
PRIMARY WIRING FOR 220-240 VOLT
220V XFMR P/N 300023
240V XFMR P/N 300038
WHT
BLK
F1
1/2 AMP
SLO BLO
MECHANICAL LINKAGE TO FRONT PANEL
PRIMARY WIRING FOR 110 VOLT
XFMR P/N 300017
T1
WHT P35-12
BLK P35-13
WHT BRN P35-11
CR5
CR6
J34-5
C1 .01UF 100V
C6 300UF 50V
BLUE P35-10
VIO P35-14
GRAY P35-9
J34-2
CR1
CR2
CR11
CR12
C4 .01UF 100V
J34-1
C10
C14
C18
C20
C21
C12
C16
WHT-BRN-YEL P35-15
BRN P35-2
RED P35-6
ORG P35-1
CR7
CR8
J34-3
C2 .01UF 100
C9
C13
C17
YEL P35-8
GRN P35-7
J34-9
CR3 023
CR4 023
CR13 023
CR14 023
C5 .01UF 600V
J34-8
C7 50UF 350V
R1 220K 2W
R2 200Ω 3W
CR15
CR16
CR17
C22 250UF 6V
WHT RED P35-4
WHT-ORN P35-5
WHT YEL P35-3
CR9
CR10
J34-7
C3 .01UF 100V
C8
C11
C15
C19
J34-4
R3 2K
C25 .001UF
R7 150Ω 3W WW
R6 150Ω
Q1 014
C23 25UF 50V
CR18 IN967B
C24 25UF 50V
CR19 IN967B
R5 150Ω
Q2 009
C26 .001UF
R4 2K
R8 150Ω 3W WW
J29
6 +40V
4 +28V
5 +18V
1 ANALOG COMMON
2 -18V
3 -28V
9 +14V LOGIC
12 +2V
8 +300V
7 +14V OUTPUT OPTION
15 DIG COMMON
10 GUARD
11
NOTES: UNLESS OTHERWISE SPECIFIED
3. ALL CAPACITORS 1000-PICOFARADS 25 V.
2. ALL DIODES 50 A.
1. ALL RESISTORS 1/4W, CARBON, ± 5%.
DANA LABORATORIES INC.
IRVINE, CALIFORNIA
SCHEMATIC— POWER SUPPLY
SIZE D
CODE IDENT NO.
DWG NO. 430399
D
SCALE
WT
SHEET 1 OF 1



CROSS REFERENCE CHART	
ITEM NO.	PART NO.
3.0	450188
4.0	450918
5.0	450996
7.0	500004
8.0	500005
9.0	501376
15.0	610019
16.5	610158

REF DES	B/M ITEM	DESCRIPTION
C7	2.0	50UF/350V
C16	1.0	1000UF/35V(DUAL)
C12		
C21		
C20		
C18		
C14		
C17	1.0	1000UF/35V(DUAL)
C10		

QTY REQD	SYM	ITEM NO.	GOV'T OR VENDOR NO.	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION

LIST OF MATERIAL OR PARTS LIST

402000	5403	1	1
402319	5500	1	1
NEXT ASSY	USED ON	NA	FA
APPLICATION		QTY REQD	

MATERIAL

APPLIED FINISH

HEAT TREATMENT

UNLESS OTHERWISE SPECIFIED

DIMENSIONS ARE IN INCHES

TOLERANCES ON DECIMALS: .X ± .030, .XX ± .020, .XXX ± .010; ANGLES ± 0° 30'

FORMED ANGLES ± 1.0°

ECCENTRICITY BETWEEN DIA ON THE SAME AXIS SHALL NOT EXCEED .010 TIR.

INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS MIL-D-1000 AND MIL-D-70327

CONTRACT NO.

NAME	DATE
DR M. Berg	10-13-66
CHK M. Curbi	10/17/66
APPD J. Hoban	5/17/67

DRN # 651

8-12-67 CL

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

CAPACITOR ASSEMBLY-5 CAP

SIZE	CODE IDENT NO.	DWG NO.	
C	21793	402019	B

SCALE 1/1 | WT | SHEET 1 OF 1

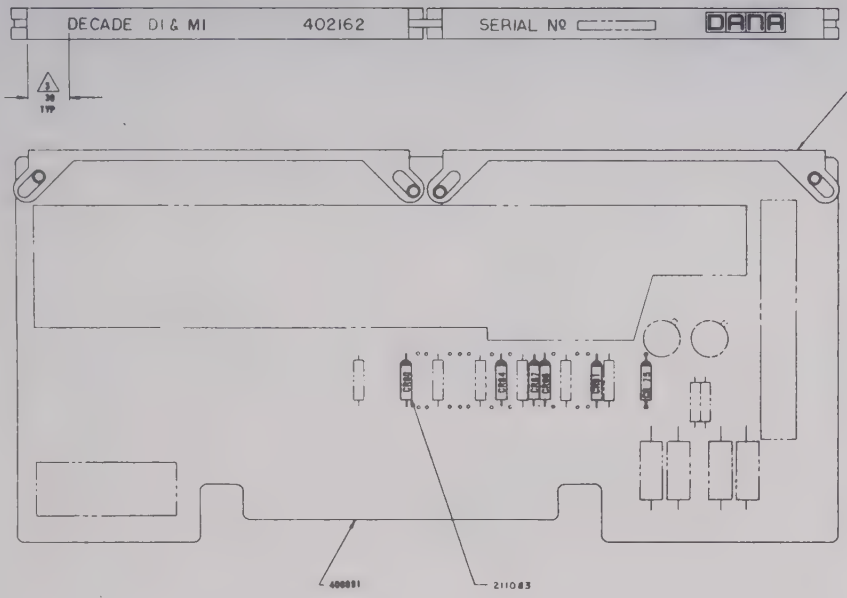
2. ASSEMBLY PROCEDURES AND PROCESSES TO CONFORM WITH DANA WORKMANSHIP STANDARDS.
1. SCHEMATIC REFERENCE: 430399

NOTES: UNLESS OTHERWISE SPECIFIED

DRAWING	MODEL 76				MODEL 77	MODEL 78			
	D1 OP	D2 OP	E1 OP	E2 OP		D1 OP	D2 OP	E1 OP	E2 OP
• DECADE ASSEMBLY	402162	402343	402342	402357	402162	402162	402343	402342	402357
• DECADE SCHEMATIC	430365	430573	430572	430579	430365	430365	430573	430572	430579
BASIC SCHEMATIC	430737	430738	430737	430738	430766	430739	430740	430739	430740
BASIC INTRACONNECTING	402677	402678	402677	402678	402677	402677	402678	402677	402678
WIRING DIAGRAM	430743	430744	430743	430744	430743	430743	430744	430743	430744
•• ISOLATED OUTPUT J211, 212,213,214,215	402151 402640	402151 402640	402151 402640	402151 402640		402151 402640	402151 402640	402151 402640	402151 402640
ISOLATED OUTPUT SCHEMATIC	430745	430745	430745	430745		430745	430745	430745	430745
•• PRINT COMMAND J215					402367 402643				
PRINT COMMAND SCHEMATIC					430746				
•• ISOLATED PROGRAMMING J216, J217					402150 402644	402150 402644	402150 402644	402150 402644	402150 402644
ISOLATED PROGRAMMING SCHEMATIC					430747	430747	430747	430747	430747
•• COMMAND & HOLD J217	402165 402645	402165 402645	402165 402645	402165 402645					
COMMAND & HOLD SCHEMATIC	430748	430748	430748	430748					
•• RANGE & FUNCTION CODING J218	402149 402655	402359 402656	402360 402657	402361 402658		402149 402655	402359 402656	402360 402657	402361 402658
RANGE & FUNCTION CODING SCHEMATIC	430751	430752	430753	430754		430751	430752	430753	430754
PRINT COMMAND LOGIC J219	402593	402593	402593	402593					
PRINT COMMAND LOGIC SCHEMATIC	430718	430718	430718	430718					
PROGRAM COMMAND LOGIC J219					402513	402513	402513	402513	402513
PROGRAM COMMAND LOGIC SCHEMATIC					430691	430691	430691	430691	430691
DELAY J220					402594	402594	402594	402594	402594
DELAY SCHEMATIC					430719	430719	430719	430719	430719

• BASIC DECADE ASSEMBLY 400891 AND SCHEMATIC 430390 USED ON ALL OPTIONS

•• THE TWO ASSEMBLIES LISTED ARE INTERCHANGEABLE AND HAVE IDENTICAL SCHEMATICS



P/N	DESCRIPTION	QTY
211083	DIODE TYPE 018	5
210004	DIODE TYPE SD-4	1
400891	PCB ASSY-DECADE BASIC	1
430365	SCHEM-DECADE MATRIX	REF
610236	HANDLE EXTRACTOR	2
610237	PIN - SPRING	4
920026	SOLDER - WIRE	A/R

QTY REQD	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION OR VENDOR P/N	ITEM NO.

LIST OF MATERIAL OR PARTS LIST

4. ASSEMBLY PROCEDURES AND PROCESSES TO CONFORM WITH DANA WORKMANSHIP STANDARDS

3 HEAT STAMP .10 HIGH BLACK CHARACTERS AND .15 HIGH LOGO LOCATED AS SHOWN

2 SCHEMATIC REFERENCE 430365

1 ALL DIODES TYPE 018, P/N 211083, EXCEPT CR75 WHICH IS AN SD-4 P/N 210004.

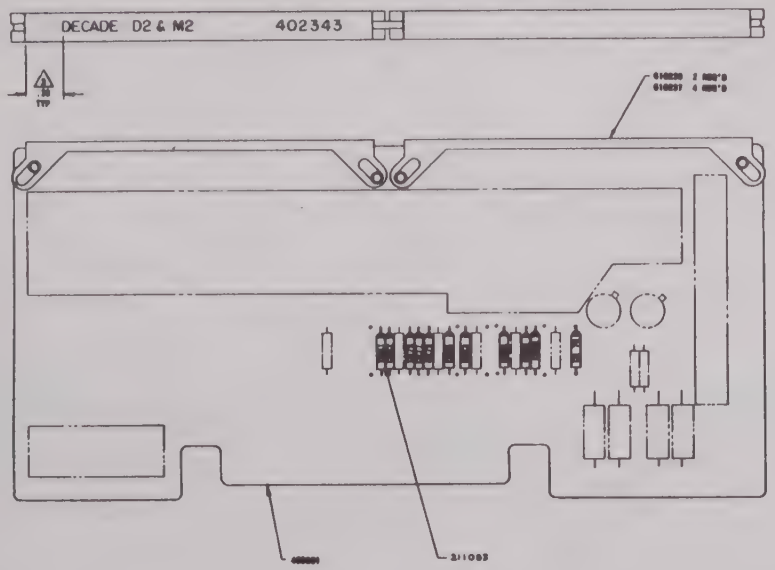
NOTE UNLESS OTHERWISE SPECIFIED

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

PC BOARD ASSY —
DECADE, OUTPUT OPT DI & MI
1-2-4-8 NEG TRUE

SIZE	CODE IDENT NO	DWG NO	REV
D	21793	402162	C

SCALE 2/1 WT SHEET 1 OF 1



P/N	DESCRIPTION	QTY
216883	DIODE TYPE 6I6	10
216884	DIODE TYPE SD-4	1
438891	PCB ASSY-DECADE BASIC	1
648236	HANDLE EXTRACTOR	2
648237	PIN-SPRING	4
438573	SCHEM-DECADE MATRIX D2 & M2	REF

LIST OF MATERIAL OR PARTS LIST

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

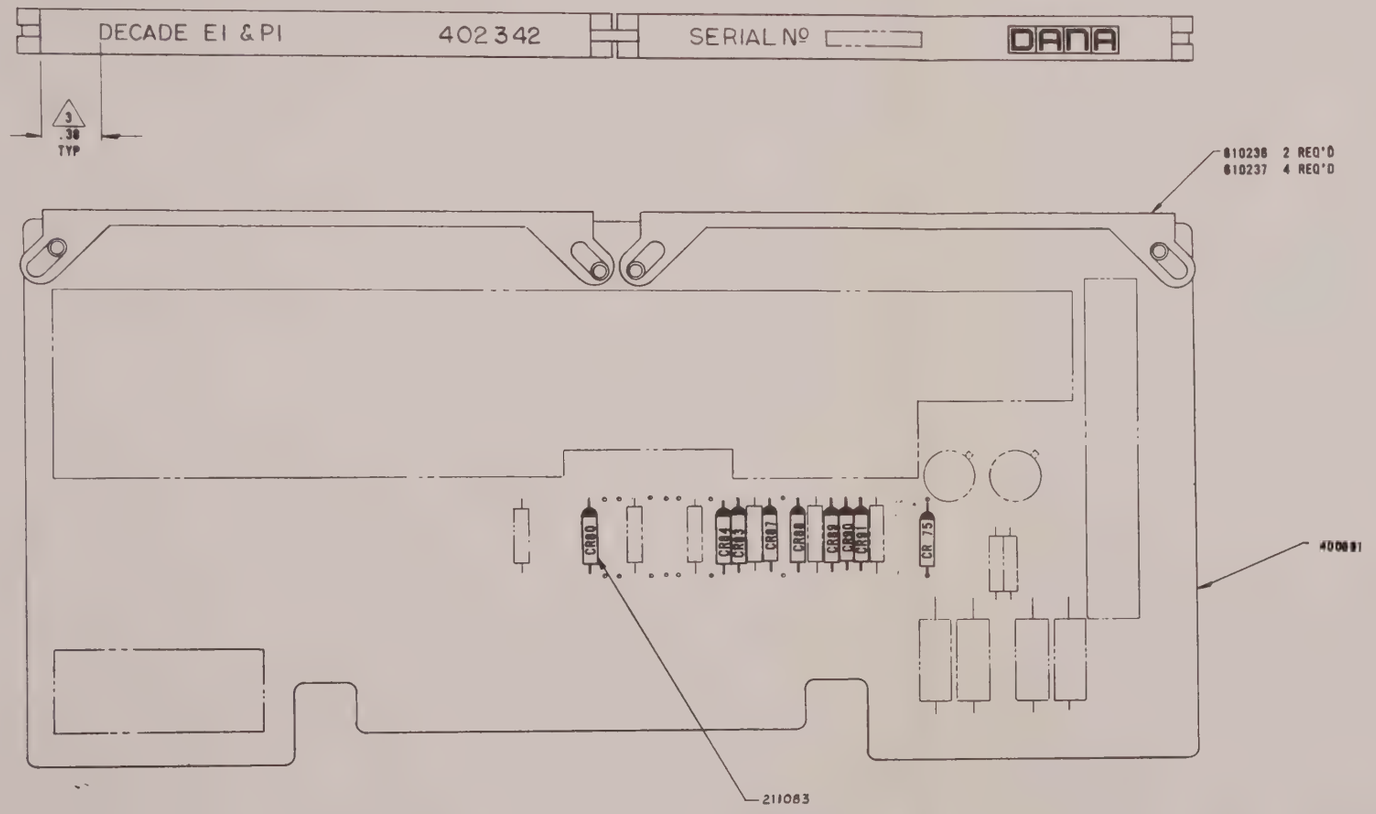
PC BOARD ASSY —
DECADE, OUTPUT OPT D2 & M2
1-2-4-8 POS TRUE

SIZE	DANA IDENT NO.	DWG NO.	REV
D	21793	402343	D

SCALE 2-1 WT SHEET 1 OF 1

4. ASSEMBLY PROCEDURES AND PROCESSES TO COMPLY WITH DANA WORKMANSHIP STANDARDS.
5. HEAT STAMP .10 HIGH BLACK CHARACTERS LOCATED AS SHOWN.
6. SCHEMATIC REFERENCE: 438573
7. ALL DIODES TYPE 6I6. P/N 216883 EXCEPT CR76 WHICH IS SD-4 P/N 216884.

NOTE: UNLESS OTHERWISE SPECIFIED



P/N	DESCRIPTION	QTY
210004	DIODE TYPE SD-4	1
211083	DIODE TYPE 018	8
400891	PCB ASSY-DECADE BASIC	1
430572	SCHEM-DECADE MATRIX, E1 & P1	REF
610236	HANDLE EXTRACTOR	2
610237-	PIN SPRING M B	4

4. ASSEMBLY PROCEDURES AND PROCESSES TO CONFORM WITH DANA WORKMANSHIP STANDARDS.
3. HEAT STAMP .10 HIGH BLACK CHARACTERS AND .15 HIGH LOGO, LOCATED AS SHOWN.
2. SCHEMATIC REFERENCE: 430572
1. ALL DIODES TYPE 018, P/N 211083, EXCEPT CR75 WHICH IS SD-4 P/N 210004.

NOTE: UNLESS OTHERWISE SPECIFIED

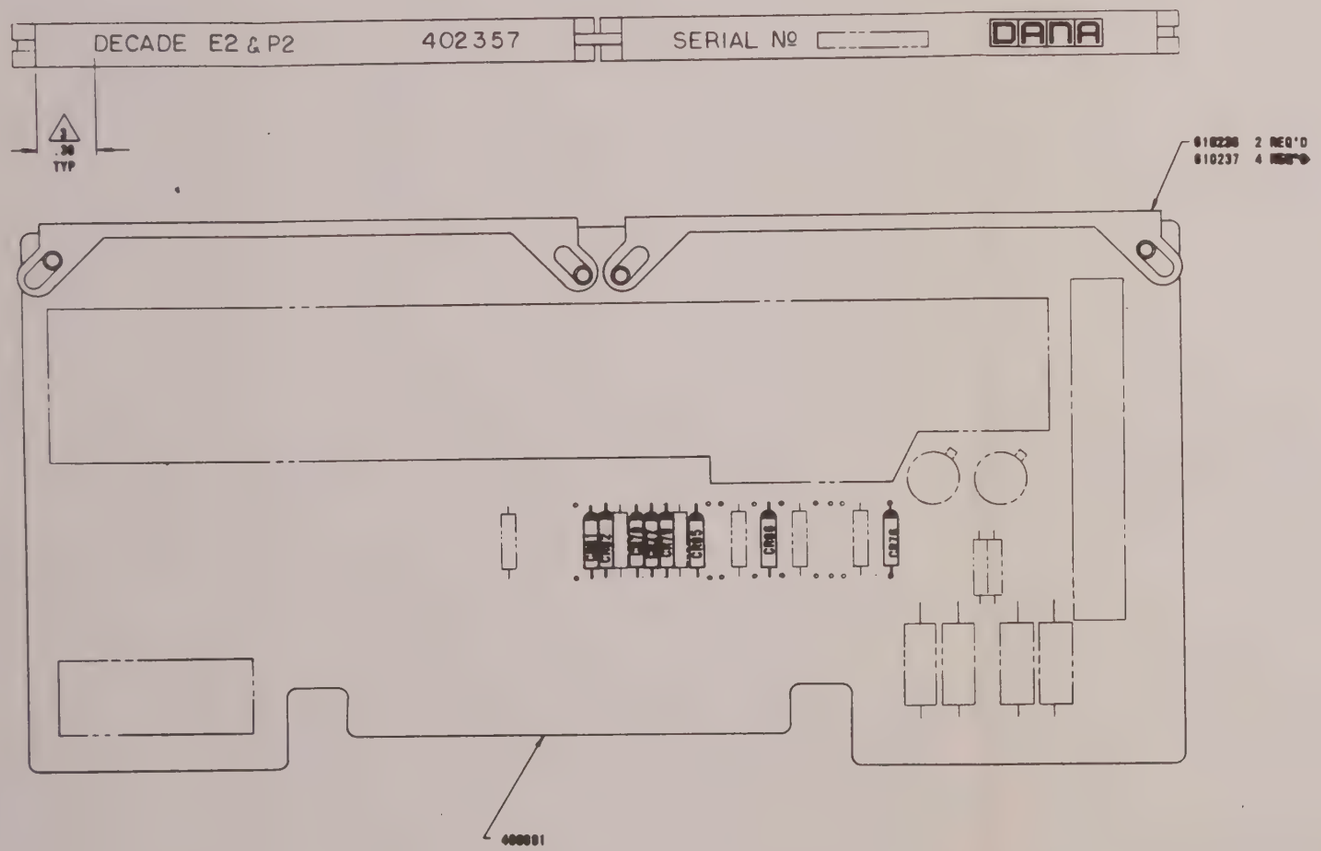
DANA LABORATORIES INC.
IRVINE, CALIFORNIA

PC BOARD ASSY —— DECADE, OUTPUT OPTE1 & P1
1-2-2-4 NEG TRUE

SIZE	CODE IDENT NO.	DWG NO.	REV
D	21793	402342	G

SCALE 2-1 | WT | SHEET 1 OF 1

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
A	REVISED AND REDRAWN	1-5-67 DJH	
B	REVISED PER EO 1836	1-25-67 DJH	
C	REVISED PER EO 4180	12-23-68 DJH	



REF DES OR ITEM	P/N	DESCRIPTION	QTY
CR76	210004	DIODE TYPE SD-4	1
CR77	211083	DIODE TYPE 018	7
CR78			
CR79			
CR81			
CR82			
CR85			
CR86	211083	DIODE TYPE 018	REF
		ASSY DECADE	1
		MATIC	REF
		HANDLE	2
		PIN-SPRING	4

400585	MOD 76-E2	5	5
400879	MOD 75-E2	5	5
400876	MOD 65-E2	4	4
400370	MOD 63-E2	4	4
400867	MOD 61-E2	4	4
NEXT ASSY	USED ON	NA	FA
APPLICATION		QTY REQD	

4. ASSEMBLY PROCEDURES AND PROCESSES TO CONFORM WITH DANA WORKMANSHIP STANDARDS.
3. HEAT STAMP .18 HIGH BLACK CHARACTERS AND .18 HIGH LOGO. LOCATED AS SHOWN.
2. SCHEMATIC REFERENCE: 430578
1. ALL DIODES TYPE 018, P/N 211083, EXCEPT CR76 WHICH IS SD-4 P/N 210004.

NOTE: UNLESS OTHERWISE SPECIFIED

QTY REQD	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION OR VENDOR P/N	ITEM NO.

LIST OF MATERIAL OR PARTS LIST

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON: DECIMALS X .030 XX .020 .XXX .010 | ANGLES 0° 30' | FORMED ANGLES 1.0

MATERIAL

FINISH

CONTRACT NO. —

DRAWN	M BERG	1-4-67
CHECK	TOFT	1-5-67
COG. ENGR	D. PAYNE	1/9/67
PROJ ENGR	J. Nelson	1/6/67

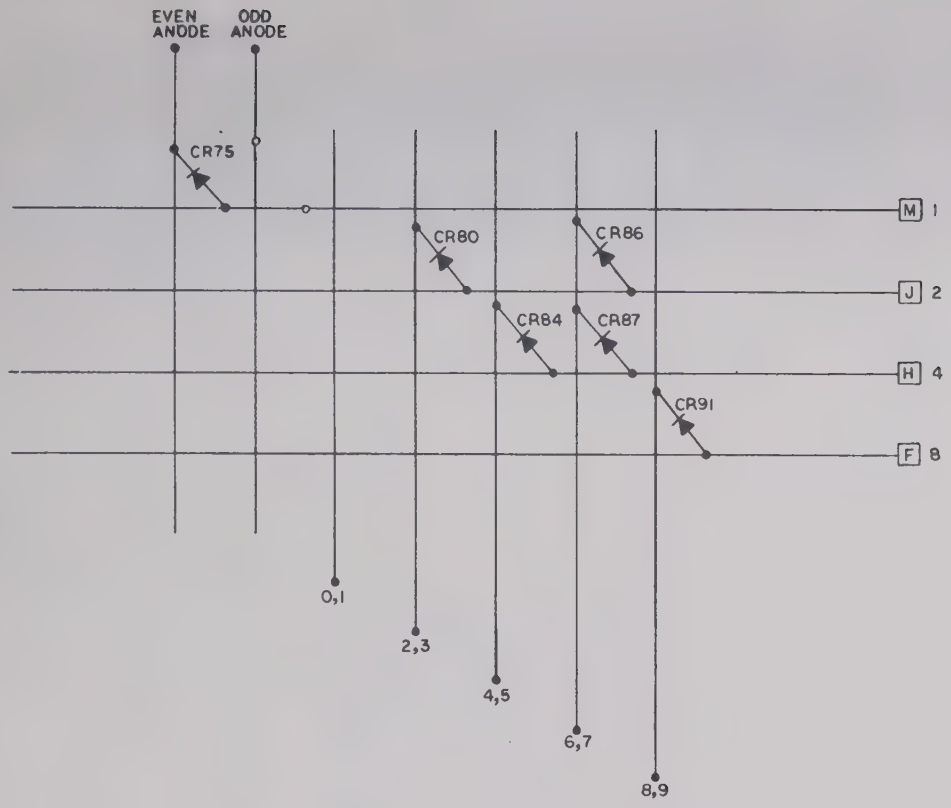
DEN# 612 8-8-67 PJ

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

PC BOARD ASSY — DECADE OUTPUT OPT E2 P2
1-2-2-4 POS. TRUE

SIZE	CODE IDENT NO.	DWG NO.	REV
D	—	402357	B

SCALE 2-1 | WT — | SHEET 1 OF 1



QTY REQD	SYM	ITEM NO.	GOVT IDENT NO.	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	SPECIFICATION

LIST OF MATERIALS OR PARTS LIST

400865	5400	REF	REF
NEXT ASSY	USED ON	NEXT ASSY	FINAL ASSY
APPLICATION		QTY REQD	

SYMBOLS
APPLICABLE TO DANA LABORATORIES INC. ONLY
SA—SUB—ASSY MRA—MAJOR REPL ASSY
MA—MODULE ASSY CA—COMPLETE ASSY

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
DECIMALS: X ± .030, XX ± .020, XXX ± .010
ANGLES ± 0° 30'

MATERIAL

APPLIED FINISH

DRAWN		1 FEB 1966
CHECK		3 FEB 1966
ENGR		2/3/66
APPR		

APPROVED

APPROVED

Rel 6-21-66
DRN #436 Pc

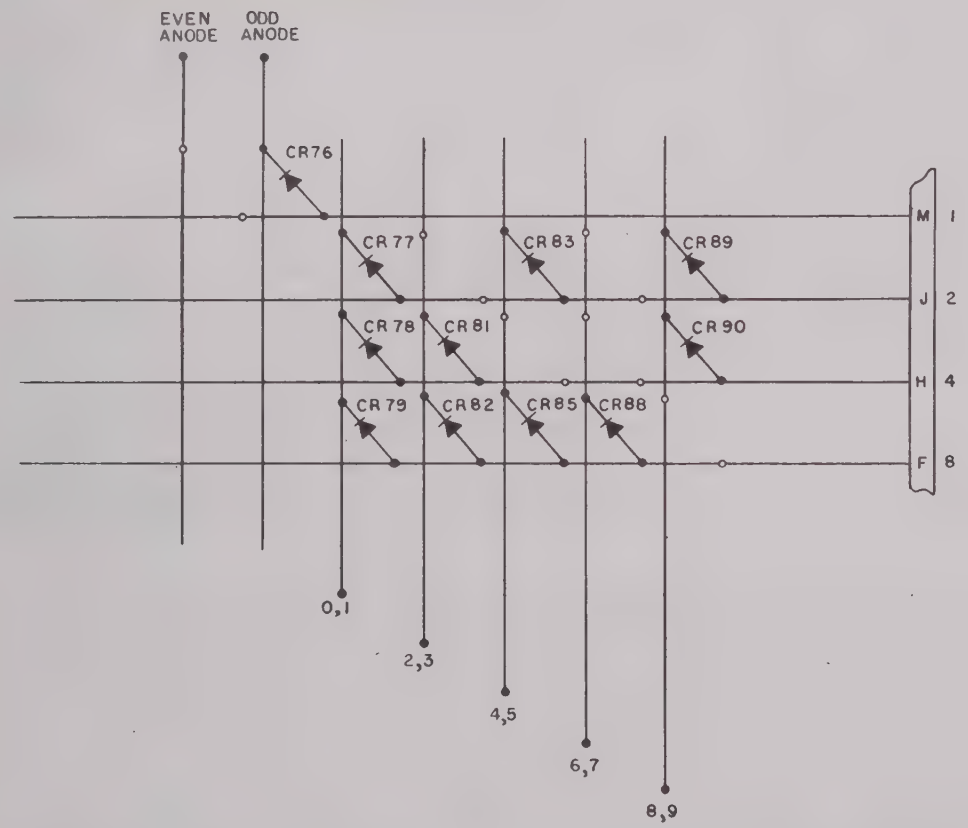
DANA LABORATORIES INC.
IRVINE, CALIFORNIA

SCHEMATIC – DECADE MATRIX, 1-2-4-8

CODE IDENT NO.	SIZE		
	C	430365	B
SCALE	WEIGHT	SHEET 1 OF 1	

1. ALL DIODES ARE 018 EXCEPT CR75 WHICH IS AN SD-4

NOTES: UNLESS OTHERWISE SPECIFIED



QTY REQD	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION OR VENDOR P/N	ITEM NO.
		MOD 75-D2	REF		REF
		MOD 73-D2	REF		REF
		MOD 65-D2	REF		REF
		MOD 63-D2	REF		REF
402343		MOD 61-M2	REF		REF

LIST OF MATERIAL OR PARTS LIST

NEXT ASSY	USED ON	NA	FA
APPLICATION		QTY REQD	

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON:
DECIMALS: X .030, XX .020, XXX .010 | ANGLES 0° 30' | FORMED ANGLES 1.0

MATERIAL

FINISH

CONTRACT NO.

DRAWN	ABBOTT	12/20/66 4 JAN 66
CHECK	Toft	
COG. ENGR	D Payne	11/4/67
PROJ ENGR	J. Nelson	10 FEB 67

DEN 61-
3-8-67

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

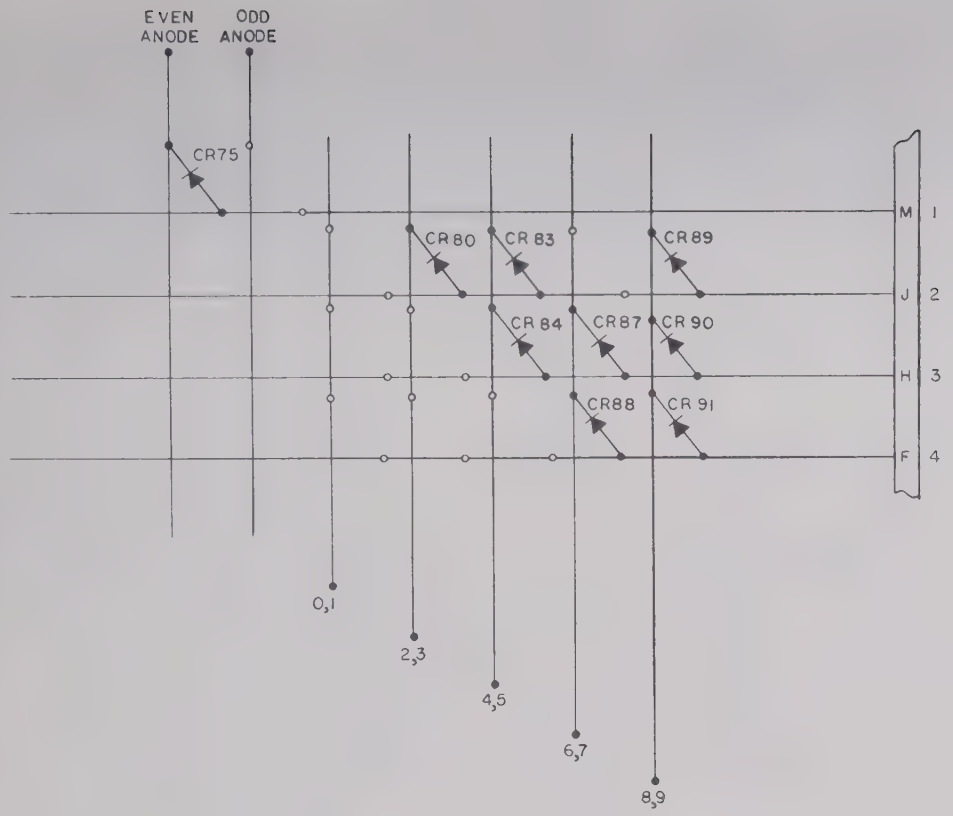
SCHEMATIC – DECADE MATRIX, OUTPUT OPT D2 & M2 1-2-4-8 POS. TRUE

SIZE	CODE IDENT NO.	DWG NO.	REV
C	——	430573	B

SCALE —— WT —— SHEET 1 OF 1

1. ALL DIODES ARE 018 EXCEPT CR76 WHICH IS AN SD-4

NOTES: UNLESS OTHERWISE SPECIFIED



QTY REQD	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION OR VENDOR P/N	ITEM NO.
		MOD75-E1 / MOD 73-E1	REF		REF
		MOD 65-E1 / MOD63-E1	REF		REF
402 3421		MOD 61-P1	REF		REF
NEXT ASSY	USED ON		NA		FA
APPLICATION			QTY REQD		

LIST OF MATERIAL OR PARTS LIST

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON:
DECIMALS: X .030, XX .020, XXX .010 | ANGLES 0° 30' | FORMED ANGLES 1.0

MATERIAL

FINISH

CONTRACT NO.

DRAWN	ABBOTT	12/20/66 4 JAN 66
CHECK	Toft	
COG. ENGR	D Payne	1/4/67
PROJ ENGR	J. Nelson	1/10/67

Drawing 5-8 61 fl

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

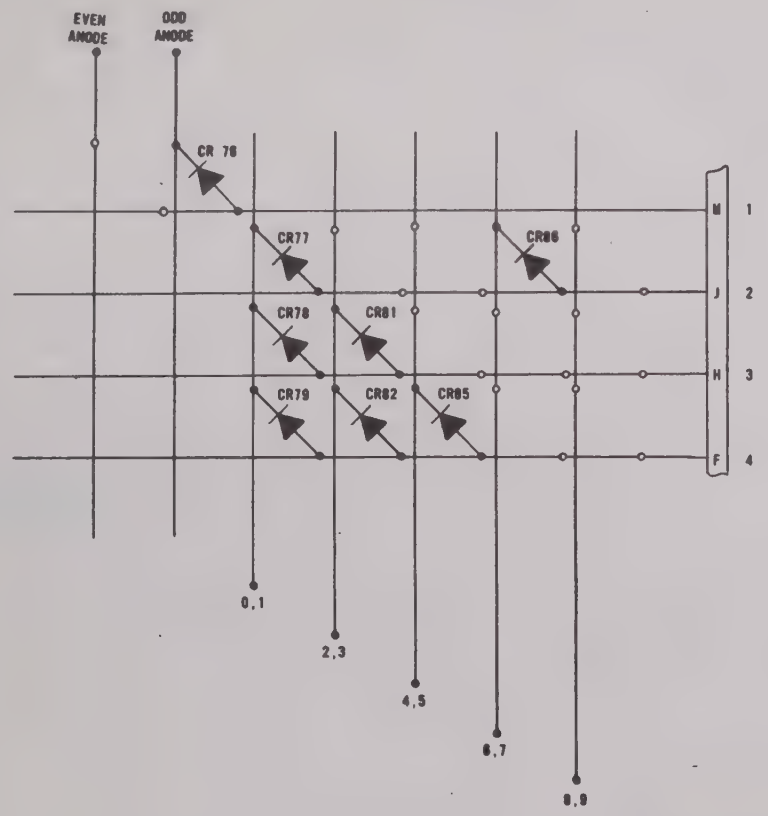
SCHEMATIC – DECADE MATRIX, OUTPUT OPTE1 & P1
1-2-4 NEG. TRUE

SIZE	CODE IDENT NO.	DWG NO.	REV
C	—	430572	B

SCALE — WT — SHEET 1 OF 1

NOTES UNLESS OTHERWISE SPECIFIED

1. ALL DIODES ARE 018 EXCEPT CR75 WHICH IS AN SD-4



0. : ALL DIODES ARE 010 EXCEPT CR76 WHICH IS AN SD-4

NOTES: UNLESS OTHERWISE SPECIFIED

QTY REQD	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION OR VENDOR P/N	ITEM NO.
		LIST OF MATERIAL OR PARTS LIST			

		Mod 78-82		
		Mod 73-82		
		Mod 68-82		
		Mod 63-82		
402357	Mod 61-P2	REF	REF	
NEXT ASSY	USED ON	NA	FA	
APPLICATION		QTY REQD		

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON:
DECIMALS: X .030, XX .020, XXX .010 | ANGLES 0° 30' | FORMED ANGLES 1.0

MATERIAL

FINISH

CONTRACT NO.

DRAWN	M. Berg	1-22-67
CHECK	[illegible]	1-25-67
COG. ENGR	D. Payne	1/4/67
PROJ ENGR	J. Nelson	1/5/67

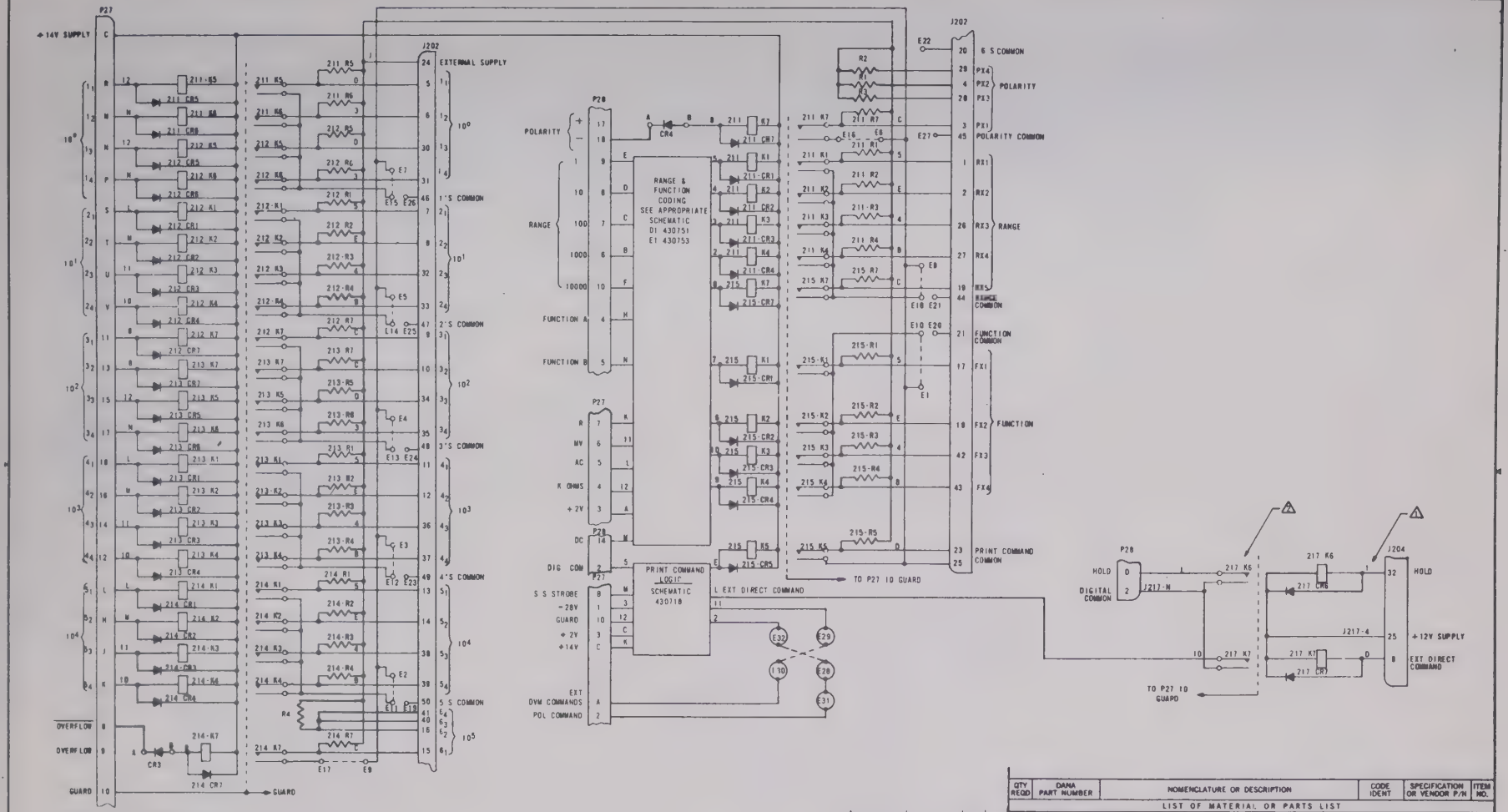
DEV 612
3-8-67 gk

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

SCHEMATIC-DECADE MATRIX, OUTPUT OPTE2 & P2 1-2-4 POS TRUE

SIZE	CODE IDENT NO.	DWG NO.	REV
C	—	430579	C

SCALE — | WT — | SHEET 1 OF 1



5 ALL RELAYS ARE DANA P N 31001?

4 ALL RESISTORS ARE 47R 1-4W 5% CARBON

3 ALL DIODES ARE D18

2 TYPICAL NUMBER, REPRESENTS CONNECTOR CONTACTS ON BOARD THAT PLUGS INTO INTRACONN BOARD (EXAMPLE SHOWN IS CONN 217 PIN 1);

1 TYPICAL CODE 217-K6 INDICATES RELAY 6 (K6) ON PC BD THAT PLUGS INTO CONN (217) ON INTRACONN BOARD

NOTE: UNLESS OTHERWISE SPECIFIED

QTY REQD	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION OR VENDOR P/N	ITEM NO.
		LIST OF MATERIAL OR PARTS LIST			

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON DECIMALS) ANGLES ± 0° 30' FORMED ANGLES ± 1°

MATERIAL

FINISH

CONTRACT NO.

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

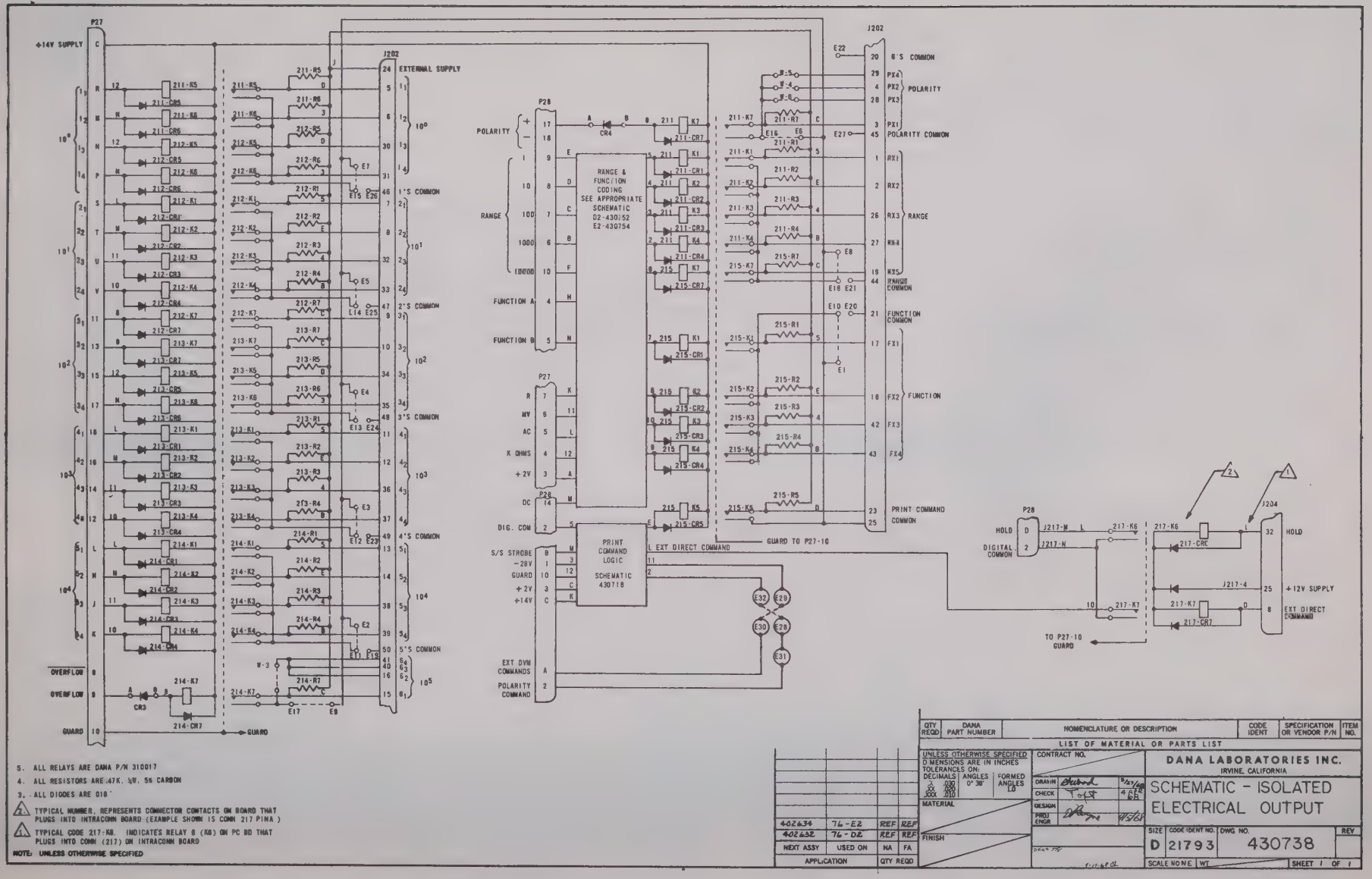
DRAWN R. Howard 8/3/68
CHECK 4 APR 68
DESIGN
PROJ ENGR 8/5/68

SCHEMATIC - ELECTRICAL
ISOLATED OUTPUT

NEXT ASSY	USED ON	NA	FA
APPLICATION		QTY REQD	

SIZE	CODE IDENT NO.	DWG NO	REV
D	21793	430737	

SCALE NONE WT SHEET 1 OF 1



5. ALL RELAYS ARE DANA P/N 310017
4. ALL RESISTORS ARE .47K, ¼W, 5% CARBON
3. ALL DIODES ARE 018
2. TYPICAL NUMBER, 8 REPRESENTS CONNECTOR CONTACTS ON BOARD THAT PLUGS INTO INTRACONN BOARD (EXAMPLE SHOWN IS CONN 217 PINA)
1. TYPICAL CODE 217-K8, INDICATES RELAY 8 (K8) ON PC BD THAT PLUGS INTO CONN (217) ON INTRACONN BOARD

NOTE: UNLESS OTHERWISE SPECIFIED

QTY REQD	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION OR VENDOR P/N	ITEM NO.
402634	76-E2	REF	REF		
402632	76-D2	REF	REF		
NEXT ASSY	USED ON	NA	FA		
APPLICATION		QTY REQD			

LIST OF MATERIAL OR PARTS LIST

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON: DECIMALS .XX .030, .XXX .010 | ANGLES 0° 30' | FORMED ANGLES 1.0

MATERIAL

FINISH

CONTRACT NO.

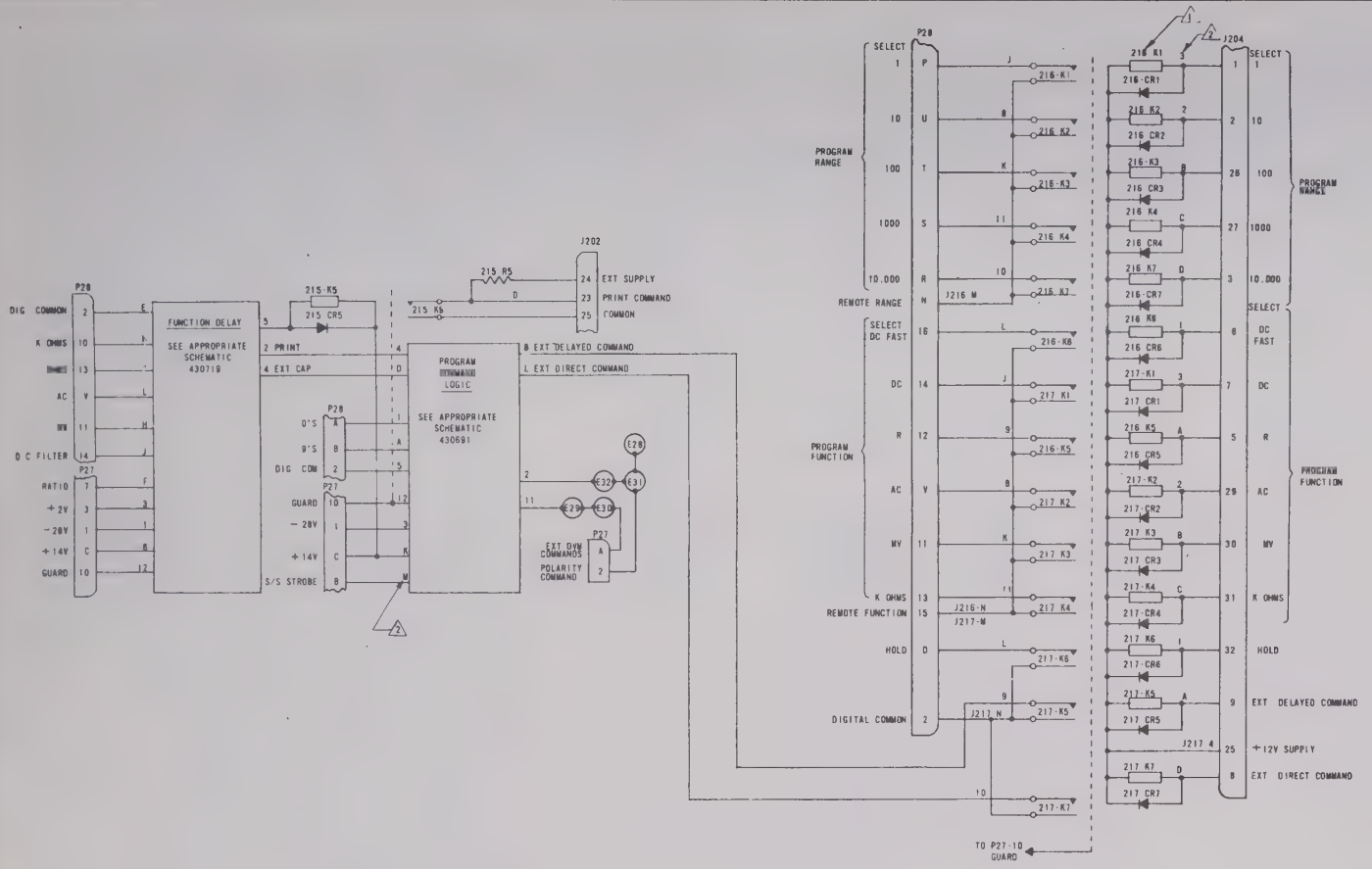
DANA LABORATORIES INC.
IRVINE, CALIFORNIA

DRAWN 8/27/68
CHECK 8/27/68
DESIGN
PROJ ENGR 8/27/68

SCHEMATIC - ISOLATED ELECTRICAL OUTPUT

SIZE	CODE IDENT NO.	DWG NO.	REV
D	21793	430738	

SCALE NONE | WT | SHEET 1 OF 1



⚠2 TYPICAL NUMBER REPRESENTS CONNECTOR CONTACTS ON BOARD THAT PLUGS INTO INTRACOMM BOARD (EXAMPLE SHOWN IS CONN 216 PIN 3)

⚠1 TYPICAL CODE 216-K1 INDICATES RELAY 1 (K1) ON PC BD THAT PLUGS INTO CONN (216) ON INTRACOMM BOARD

NOTE UNLESS OTHERWISE SPECIFIED

QTY REQD	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION OR VENDOR P/N	ITEM NO.

LIST OF MATERIAL OR PARTS LIST

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON DECIMALS: X .030, XX .020, XXX .010; ANGLES 0° 30'; FORMED ANGLES 1.0

MATERIAL

FINISH

CONTRACT NO.

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

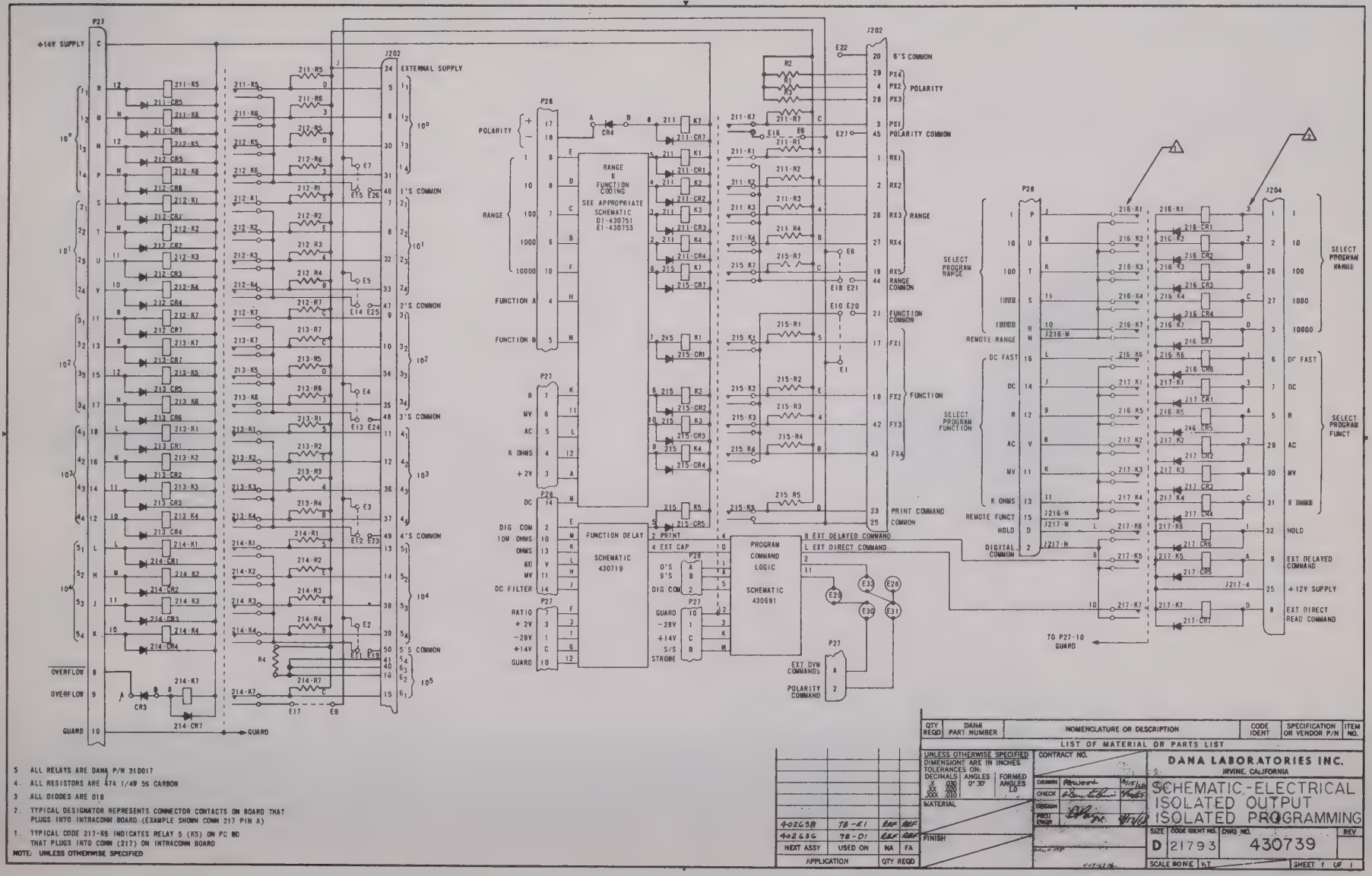
DRAWN Kirkwood 3/1/68
CHECK J. Nielsen 3/5/68
DESIGN
PROJ ENGR 4/12/68

SCHEMATIC - ISOLATED PROGRAMMING

SIZE	CODE IDENT NO.	DWG NO.	REV
D	21793	430766	

SCALE NONE WT SHEET 1 OF 1

402.677	77 D1	REF	REF
NEXT ASSY	USED ON	NA	FA
APPLICATION		QTY REQD	



5. ALL RELAYS ARE DANA P/N 310017
4. ALL RESISTORS ARE 47k 1/4W 5% CARBON
3. ALL DIODES ARE 018
2. TYPICAL DESIGNATOR REPRESENTS CONNECTOR CONTACTS ON BOARD THAT PLUGS INTO INTRACONN BOARD (EXAMPLE SHOWN CONN 217 PIN A)
1. TYPICAL CODE 217-K5 INDICATES RELAY 5 (K5) ON PC BD THAT PLUGS INTO CONN (217) ON INTRACONN BOARD

NOTE: UNLESS OTHERWISE SPECIFIED

QTY REQD	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION OR VENDOR P/N	ITEM NO.
		LIST OF MATERIAL OR PARTS LIST			

402638	78-61	REF	REF
402636	78-01	REF	REF
NEXT ASSY	USED ON	NA	FA
APPLICATION		QTY REQD	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON: DECIMALS X .030 .XX .020 .XXX .010 | ANGLES 0° 30' | FORMED ANGLES 1.0

MATERIAL

FINISH

CONTRACT NO.

DRAWN Richard 9/15/60

CHECK Walter Hayes

DESIGN

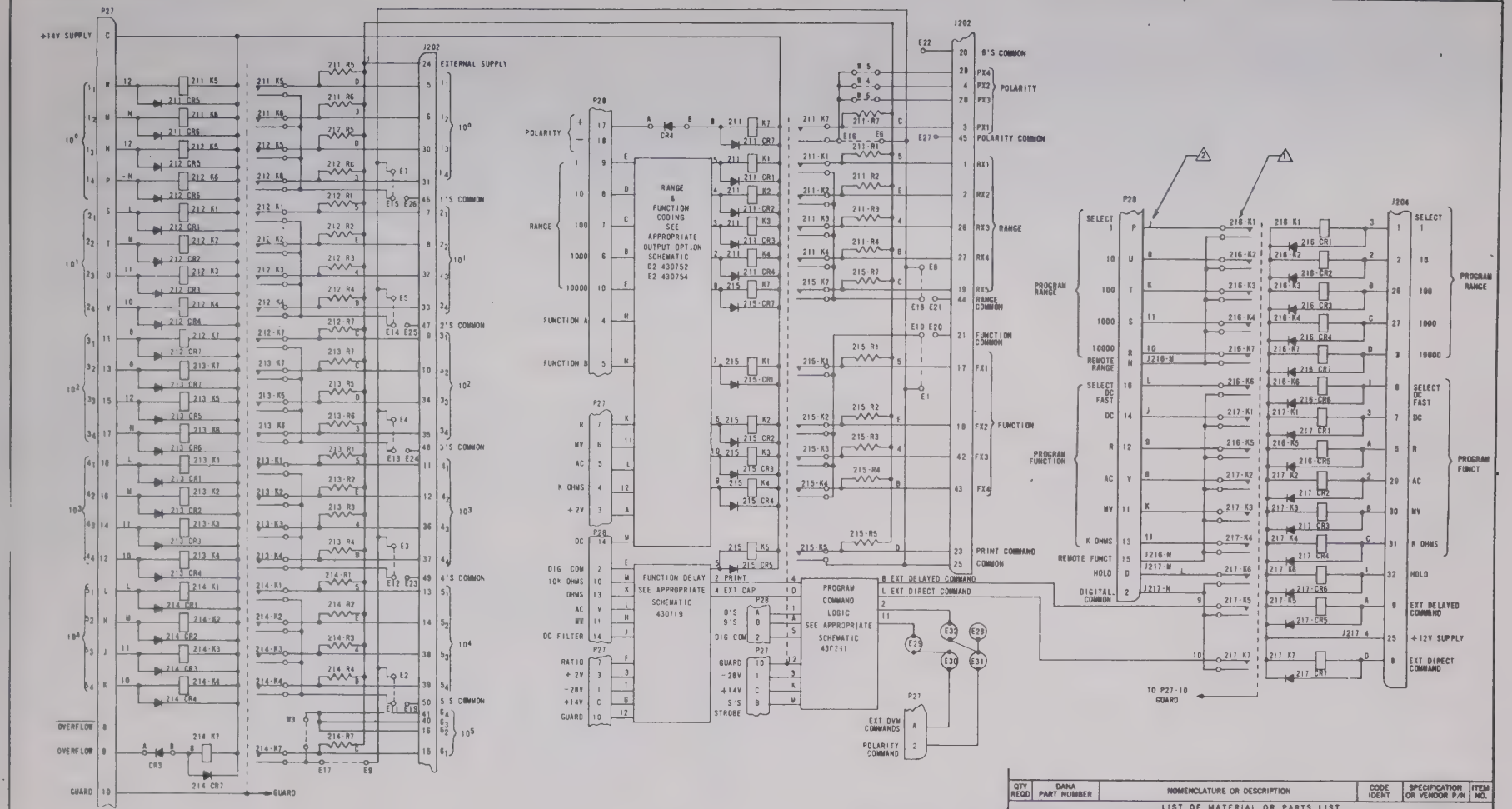
PROJ ENGR

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

SCHEMATIC-ELECTRICAL ISOLATED OUTPUT ISOLATED PROGRAMMING

SIZE	CODE IDENT NO.	DWG NO.	REV
D	21793	430739	

SCALE NONE | WT | SHEET 1 OF 1



2 TYPICAL NUMBER REPRESENTS CONNECTOR CONTACTS ON BOARD THAT PLUGS INTO INTRACONN BOARD (EXAMPLE SHOWN IS CONN 216 PIN 3)

1 TYPICAL CODE 218-K1 INDICATES RELAY 1(K1) ON PC BD THAT PLUGS INTO CONN (216) ON INTRACONN BOARD

NOTE UNLESS OTHERWISE SPECIFIED

QTY REQD	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION OR VENDOR P/N	ITEM NO.

LIST OF MATERIAL OR PARTS LIST

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON: DECIMALS ANGLES .X .030 0° 30' .XX .010 .XXX .005
FORMED ANGLES 1.0

MATERIAL

FINISH

NEXT ASSY	USED ON	NA	FA
APPLICATION		QTY REQD	

CONTRACT NO

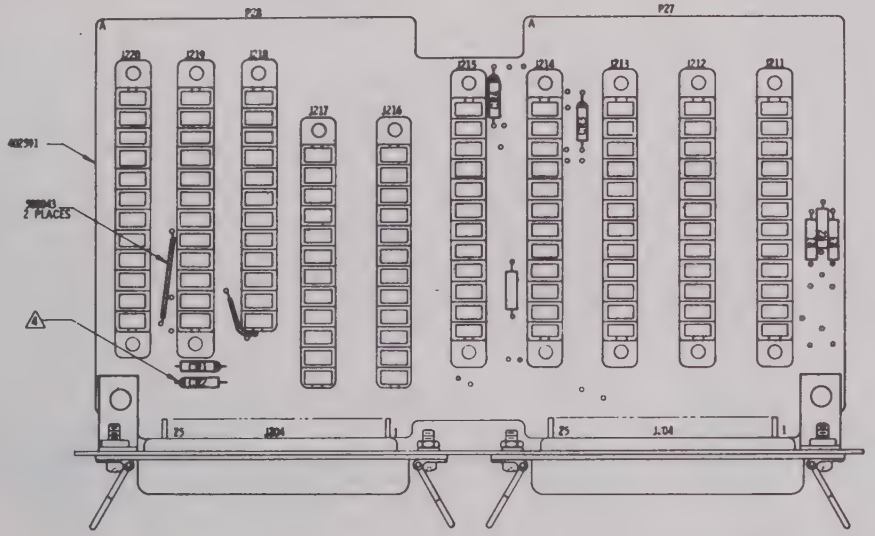
DRAWN Rasmussen 9/15/68
CHECK J. Melone 9/16/68
DESIGN
PROJ ENGR Dana 9/16/68

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

SCHEMATIC - ELECTRICAL ISOLATED OUTPUT ISOLATED PROGRAMMING

SIZE D | CODE IDENT NO 21793 | DWG NO 430740 | REV

SCALE NONE | WT | SHEET 1 OF 1



REF DES OR ITEM	P/N	DESCRIPTION	QTY
CR3	218804	DIODE SB4	2
CR4	218804	DIODE SB4	REF
R1	688473	RESISTOR 49K	4
R2	688473	RESISTOR 49K	REF
R3	688473	RESISTOR 49K	REF
R4	688473	RESISTOR 49K	REF
	402591	P.C. BOARD ASSY	1
	430743	SCHEMATIC	REF
	398043	WIRE 24 GA TEFLON	A/R
	982886	SOLDER	A/R

⚠ DIODES CR1 & CR2 ARE PART OF THE BASIC ASSY, 402591

1. REFERENCE: WIRING DIAGRAM 430743
2. ASSEMBLY PROCEDURES AND PROCESSES TO CONFORM WITH DANA WORKMANSHIP STANDARDS.
1. ALL RESISTORS ARE 1/4W, +5%, CARBON.

NOTES: UNLESS OTHERWISE SPECIFIED

403638	78-01	1	1
402634	78-01	1	1
402635	77-01	1	1
402633	76-01	1	1
402631	76-01	1	1
NEXT DWG	USED ON	NEXT ASSY	PARENT ASSY
APPLICATION		QTY REQD	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES AND INCLUDE THICKNESS OF PLATING

TOLERANCES

DECIMALS X.XXX ±.005 XX.XXX ±.010 .XXX.XXX

ANGLES 0° 30' FRACTIONS 1/16

HOLE DIAMETERS ±.004 -.001

DIMENSIONING AND TOLERANCES PER USAS Y14.10

MATERIAL

FINISH

DRAWN

CHECK

ENGR APPR.

MFG APPR.

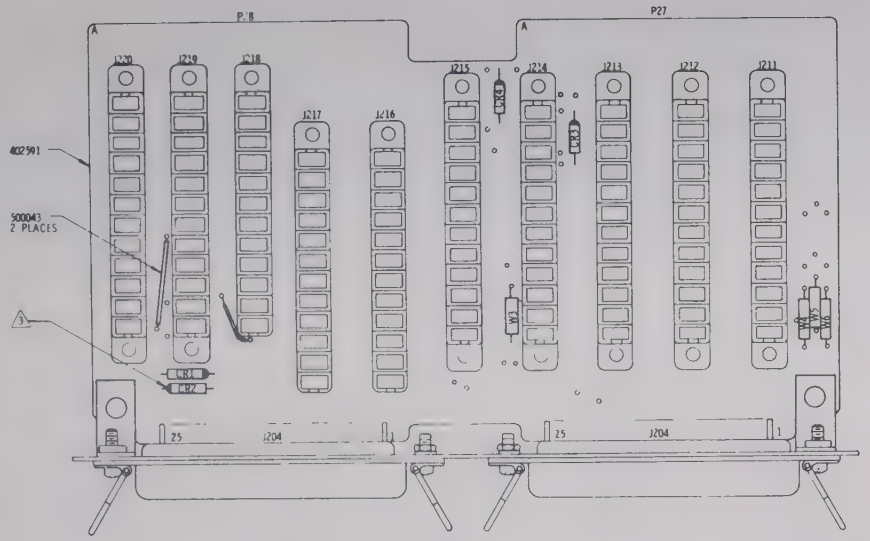
QUAL APPR.

DANA DANA LABORATORIES INC. IRVINE, CALIFORNIA

PC BOARD ASSY INTRACONNECTION

SIZE D | CODE IDENT NO. 21793 | DWG NO. 402677 | REV C

SCALE 2/1 | SHEET 1 OF 1



REF DES OR ITEM	P/N	DESCRIPTION	QTY
CR3	210004	DIODE SD4	2
CR4	210004	DIODE SD4	REF
W3	600245	INSULATED JUMPER	4
W4	600245	INSULATED JUMPER	REF
W5	600245	INSULATED JUMPER	REF
W6	600245	INSULATED JUMPER	REF
	402591	P.C. BOARD ASSY	1
	430744	SCHEMATIC	REF
	500043	WIRE 24 GA TEFLON, COATED	AR
	920026	SOLDER	AR

402639	78-E2	1	1
402632	78-D2	1	1
402634	76-E2	1	1
402632	76-D2	1	1
NEXT DWG	USED ON	NEXT DWG	FINAL ASSY
APPLICATION		QTY REQD	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES AND INCLUDE THICKNESS OF PLATING

TOLERANCES

DECIMALS	ANGLES	HOLE DIAMETERS
X .030 XX .020 XXX .010	0° 30' FORMED 1° 0'	+ .004 - .001

DIMENSIONS AND TOLERANCES PER USAS Y14.15

MATERIAL | FINISH

DRAWN	R. Cunningham	9-17-69
CHECK	V. Asplund	9-22-69
DESIGN		
MECH ENGR		
PROJ ENGR		
PROD ENGR	[illegible]	9-22-69

DANA DANA LABORATORIES INC.
IRVINE, CALIFORNIA

PC BOARD ASSY INTRACONNECTION

SIZE	CODE IDENT NO	DWG NO	REV
D	21793	402678	C

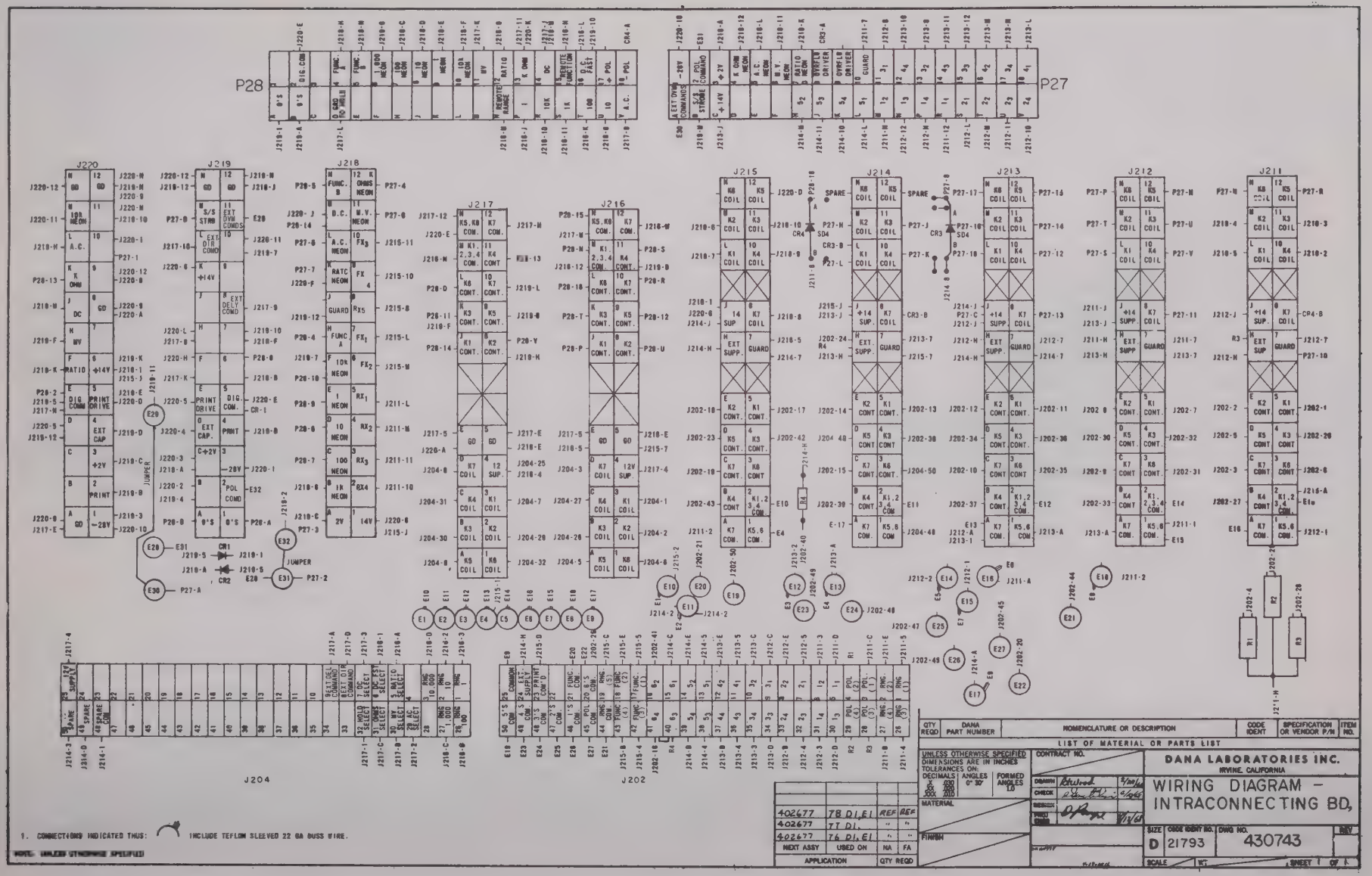
SCALE 2:1 SHEET 1 OF 1

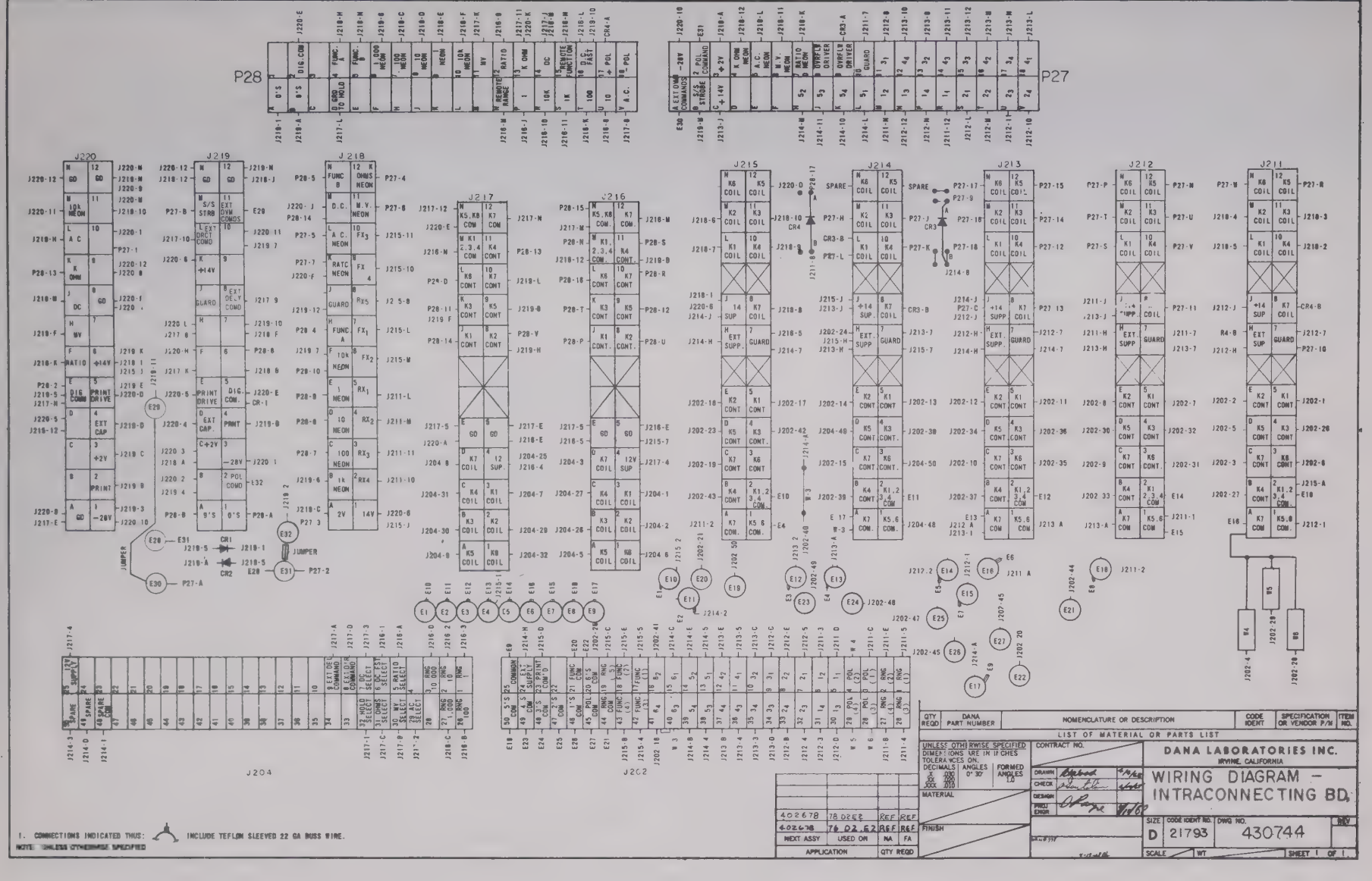
⚠3 DIODES CR1 & CR2 ARE PART OF BASIC BOARD ASSY, 402591

2. REFERENCE WIRING DIAGRAM: 430744

1. ASSEMBLY PROCEDURES AND PROCESSES TO CONFORM WITH DANA WORKMANSHIP STANDARDS

NOTES: UNLESS OTHERWISE SPECIFIED


P28
P27
J220
J219
J218
J217
J216
J215
J214
J213
J212
J211
J204
J202
1. CONNECTIONS INDICATED THUS:
INCLUDE TEFLON SLEEVED 22 GA BUSS WIRE.
QTY REQD
DANA PART NUMBER
NOMENCLATURE OR DESCRIPTION
CODE IDENT
SPECIFICATION OR VENDOR P/N
ITEM NO.
LIST OF MATERIAL OR PARTS LIST
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON: DECIMALS ANGLES .X .030 0° 30' .XX .010 .XXX .005
FORMED ANGLES ±0
MATERIAL
FINISH
CONTRACT NO.
DANA LABORATORIES INC.
IRVINE, CALIFORNIA
DRAWN
CHECK
ENGR
PROJ ENGR
WIRING DIAGRAM - INTRACONNECTING BD,
SIZE
CODE IDENT NO.
21793
DWG NO.
430743
REV
D
SCALE
WT
SHEET 1 OF 1
402677 78 DI,EI REF REF
402677 77 DI. " "
402677 76 DI,EI " "
NEXT ASSY
USED ON
NHA
FA
APPLICATION
QTY REQD



QTY REQD	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION OR VENDOR P/N	ITEM NO.

LIST OF MATERIAL OR PARTS LIST

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON: DECIMALS X .030, XX .010, XXX .010; ANGLES 0° 30'; FORMED ANGLES 1.0

MATERIAL

FINISH

402678	78 02 62	REF	REF
402678	76 02 62	REF	REF
NEXT ASSY	USED ON	NA	FA
APPLICATION		QTY REQD	

CONTRACT NO.

DRAWN

CHECK

DESIGN

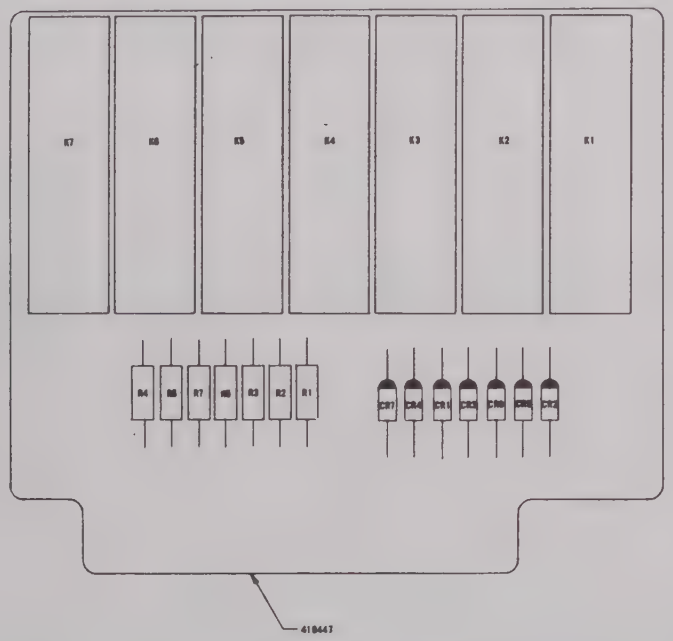
PROJ ENGR

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

WIRING DIAGRAM — INTRACONNECTING BD.

SIZE	CODE IDENT NO.	DWG NO.	REV
D	21793	430744	

SCALE | WT | SHEET 1 OF 1



K7	310017	MC1 61-123
K1	310017	MC1 61-123
CR7	211003	810
CR1	211003	810
R7	000473	47 k
R1	000473	47 k

QTY REQD	SYM	ITEM NO.	GOVT OR VENDOR NO.	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION
5			402639	18-11	[illegible]	4	4
5			402636	18-11	[illegible]	4	4
5			402637	18-03	[illegible]	4	4
5			402636	18-11	[illegible]	4	4
5			402639	76-E2	[illegible]	4	4
5			1[illegible]693	76-E1	[illegible]	4	4
5			4[illegible]	76-D2	[illegible]	4	4
5			4[illegible]	18-03	[illegible]	4	4

NEXT ASSY	USED ON	NA	FA	NEXT ASSY	USED ON	NA	FA
APPLICATION		QTY REQD		APPLICATION		QTY REQD	

MATERIAL

APPLIED FINISH

HEAT TREATMENT

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
DECIMALS: .XX ± .020, .XXX ± .010
ANGLES ± 0° 30'
FORMED ANGLES ± 1.0°
ECCENTRICITY BETWEEN DIA OR THE SAME AXIS SHALL NOT EXCEED .010 TIR.
INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS MIL-D-1000 AND MIL-D-70327

CONTRACT NO.

LIST OF MATERIAL OR PARTS LIST

NAME	DATE
DR [illegible]	4-13-64
CHK [illegible]	4-13-64
APPD [illegible]	4/14/64

4-13-64

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

PC BOARD ASSEMBLY-
ISOLATED OUTPUT

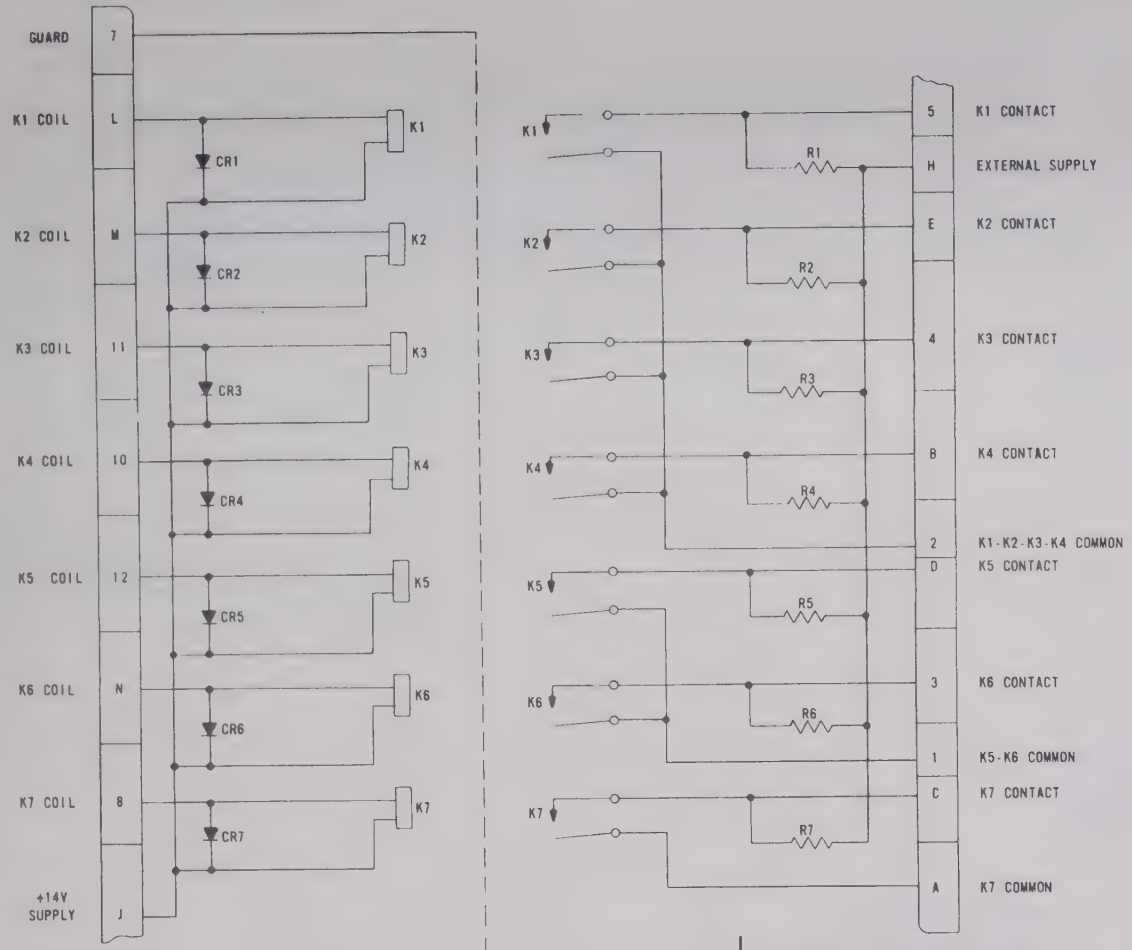
SIZE	CODE IDENT NO.	DWG NO.
D	21793	402640

SCALE 4/1 WT ——— SHEET 1 OF 1

2. ALL RESISTORS ARE 1/4 W, ± 5%, CARBON.
3. ASSEMBLY PROCEDURES AND PRACTICES TO CONFORM TO DANA WORKMANSHIP STANDARDS
4. SCHEMATIC REFERENCE: 430745

NOTES: UNLESS OTHERWISE SPECIFIED

J211-212-213-214 OR 215



QTY REQD	SYM	ITEM NO.	GOV'T OR VENDOR NO.	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION

LIST OF MATERIAL OR PARTS LIST

NEXT ASSY	USED ON	NA	FA
40764C	EC.B	F'A	R11
APPLICATION		QTY REQD	

MATERIAL

APPLIED FINISH

HEAT TREATMENT

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
DECIMALS: .X ± .030, XX ± 020, .XXX ± .010
ANGLES ± 0° 30'
FORMED ANGLES ± 1.0°
ECCENTRICITY BETWEEN DIA ON THE SAME AXIS SHALL NOT EXCEED .010 TIR.
INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS MIL-D-1000 AND MIL-D-70327

CONTRACT NO.

	NAME	DATE
DR	R.E. Wood	20 NOV 1967
CHK	[illegible]	1/22/68
APPD	D. Payne	3/1/68

4-2-68 3

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

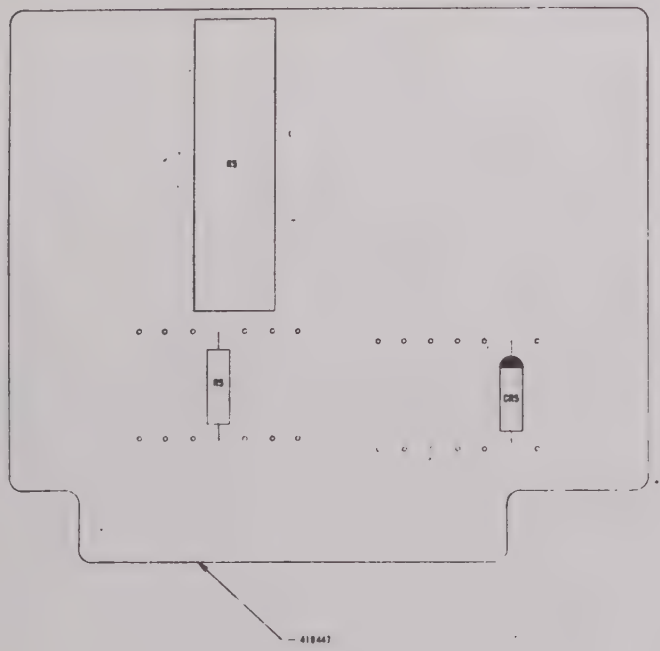
SCHEMATIC - ISOLATED OUTPUT

SIZE	CODE IDENT NO.	DWG NO.
C	21793	430745

SCALE NONE | WT | SHEET 1 OF 1

3. ALL RESISTORS ARE 47K, ¼ W, ± 5%, CARBON.
2. ALL DIODES ARE TYPE 018.
1. ALL RELAYS ARE DANA P/N 310017

NOTES: UNLESS OTHERWISE SPECIFIED



REF DES	PART NO	DESCRIPTION
R5	880473	47 K 1/4 W
R5	310017	MC1-12S
CR5	211083	018

2 ASSEMBLY PROCEDURES AND PROCESSES TO
[illegible] WITH DANA WORKMANSHIP STANDARDS.

1. SCHEMATIC REFERENCE 430746

NOTE UNLESS OTHERWISE SPECIFIED

QTY REQD	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION OR VENDOR P/N	ITEM NO.
		LIST OF MATERIAL OR PARTS LIST			
1	402635	MODEL 77			
1	402636	MODEL 67			
MEXT ASSY	USED ON	MA	FA		
APPLICATION		QTY REQD			

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON DECIMALS: .X ±.03, .XX ±.01, .XXX ±.005
ANGLES 0° 30'
FORMED ANGLES 1.0
MATERIAL
FINISH

CONTRACT NO.

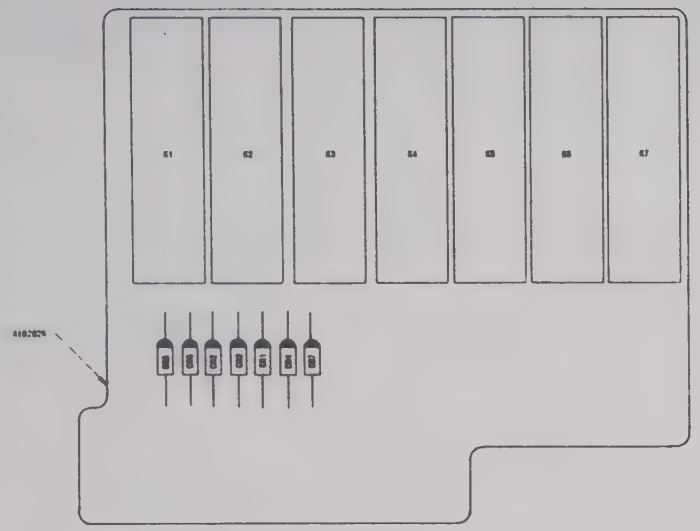
DRAWN [illegible] 2/14/67
CHECK [illegible]
ENGR APPR
PROJ ENGR [illegible] 3/16

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

PC BOARD ASSY - PRINT
COMMAND, MODEL 67&77

SIZE D | CODE IDENT NO. 91793 | DWG NO. 402643 | REV

SCALE 4-1 | WT | SHEET 1 OF 1



C7	310017	UCC C1-125
C1	310017	UCC C1-125
CR7	311053	010
CR6	311053	010

REF DESIGNAT'N	DESCRIPTION

QTY	ITEM NO.	DEPT OR VENDOR NO.	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION

LIST OF MATERIAL OR PARTS LIST

LTR	DESCRIPTION	DATE	APPROVED

UNLESS OTHERWISE SPECIFIED

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

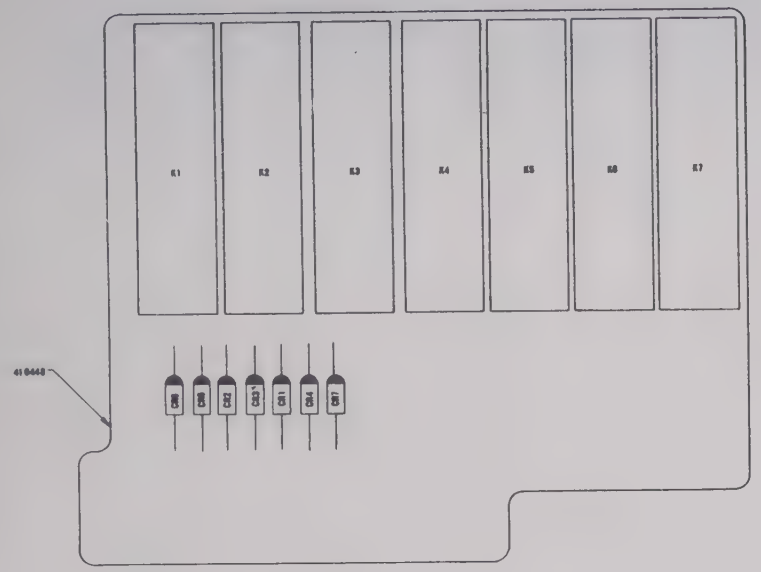
PC BOARD ASSY
ISOLATED PROGRAMMING

D — 402150

SCALE 4/1 WT — SHEET 1 OF 1

2. ASSEMBLY PROCEDURES AND PROCESSES TO CONFORM WITH DANA ENGINEERING STANDARDS
1. SCHEMATIC REFERENCE: 430400

NOTES: UNLESS OTHERWISE SPECIFIED



REF DES	PART NO	DESCRIPTION
K7	310017	EC1 E1-12S
K1	310017	EC1 E1-12S
CR7	211003	018
CR1	211003	018

QTY REQD	SYM	ITEM NO.	GOVT OR VENDOR NO.	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION
2		1		402629	78 E2		
2		2		402630	78-E1		
2		3		402631	78-D2		
2		4		402626	78-D1		
2		5		402625	77		
2		6		402624	68 E2		
2		7		402623	68-E1		
2		8		402628	68 D2		
2		9		402627	68-D1		
2		10		402622	67		

LIST OF MATERIAL OR PARTS LIST

NEXT ASSY	USED ON	RIA	FA
APPLICATION		QTY REQD	

MATERIAL

APPLIED FINISH

HEAT TREATMENT

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
DECIMALS: .X ± .030, .XX ± .010, .XXX ± .005
ANGLES: ± 0° 30'
FORMED ANGLES ± 1.0°
ECCENTRICITY BETWEEN DIA ON THE SAME AXIS SHALL NOT EXCEED .005 TIR.
INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS MIL-D-1000 AND MIL-D-70327

CONTRACT NO.

	NAME	DATE
DR	N. [illegible]	12/11/67
CHK	[illegible]	12/11/67
APPD	D. Mayne	12/11/67

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

PC BOARD ASSY-
ISOLATED PROGRAMMING

SIZE	CODE IDENT NO.	DWG NO.
D	21793	402644

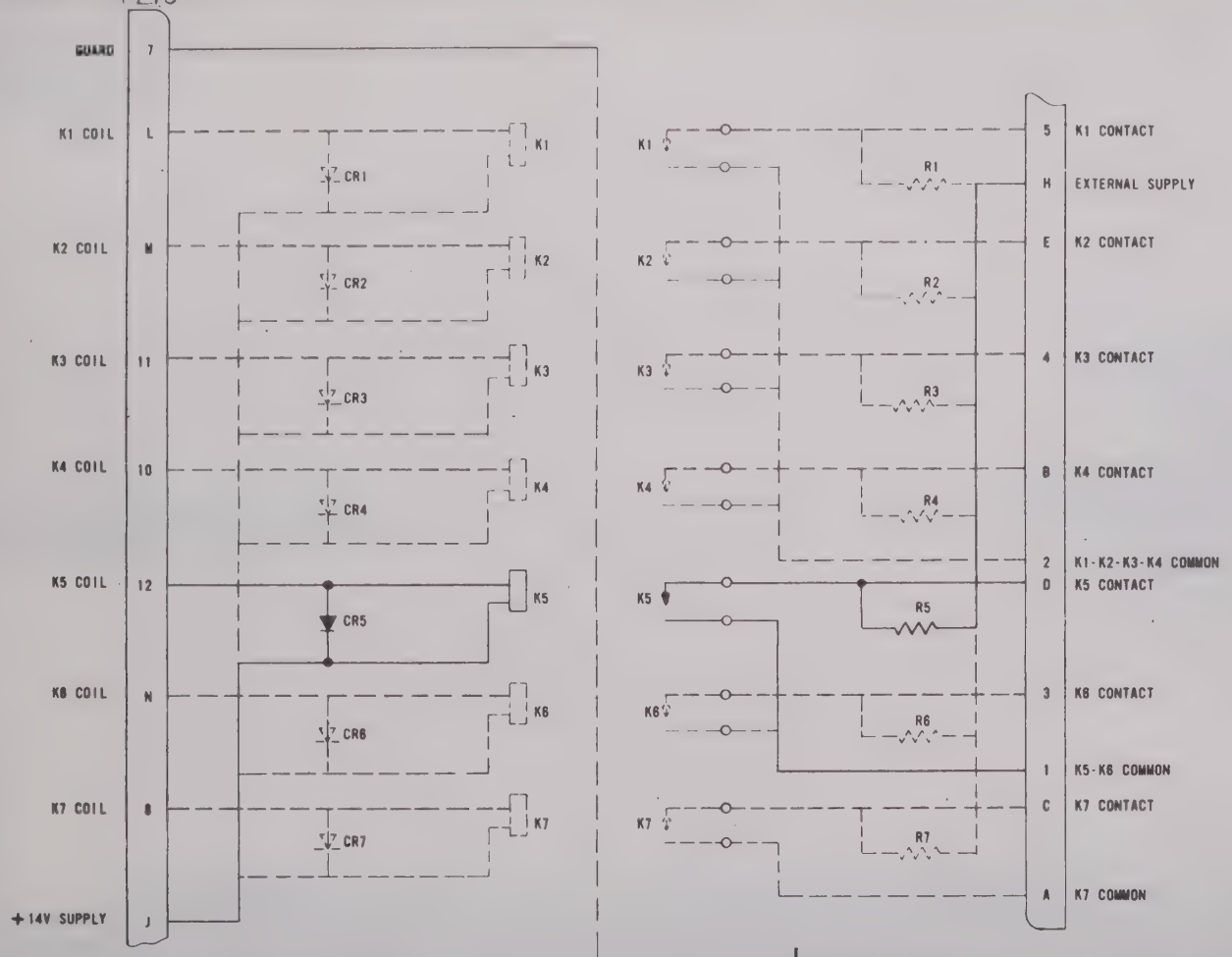
SCALE 4/1 WT SHEET OF 1

2. ASSEMBLY PROCEDURES AND PROCESSES TO [illegible]

1. SCHEMATIC REFERENCE: 430747

NOTES: UNLESS OTHERWISE SPECIFIED

P215



3. ALL RESISTORS ARE 47K, 1/4W, 5% CARBON.
2. ALL DIODES ARE TYPE 018
1. ALL RELAYS ARE DANA P/N 310013

QTY REQD	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION OR VENDOR P/N	ITEM NO.
		LIST OF MATERIAL OR PARTS LIST			

402693	67&77	REF	REF	

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON:

DECIMALS	ANGLES	FORMED ANGLES
.X .030	0° 30'	1.0
.XX .020		
.XXX .010		

MATERIAL

FINISH

CONTRACT NO.

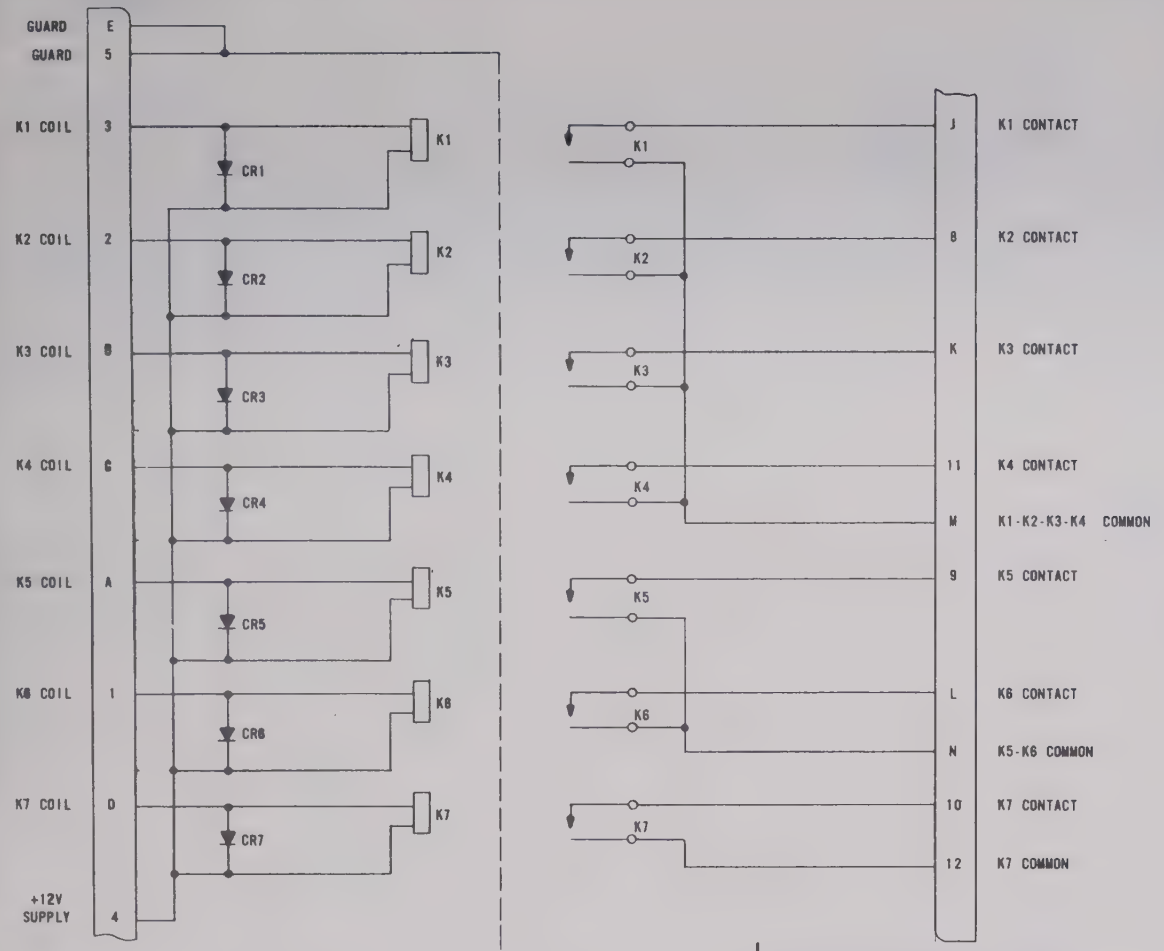
DRAWN	B.H.Wood	12/12/67
CHECK	[illegible]	[illegible]
COG. ENGR	D. Payne	1/1
PROJ ENGR	D. Payne	3/1/68

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

SCHEMATIC — PRINT COMMAND, MODEL 67&77

SIZE	CODE IDENT NO.	DWG NO.	REV

P216 OR 217



QTY REQD	SYM	ITEM NO.	GOV'T OR VENDOR NO.	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION

LIST OF MATERIAL OR PARTS LIST

		REF	REF
402..11	67,66,77,78		
NEXT ASSY	USED ON	NA	FA
APPLICATION		QTY REQD	

MATERIAL

APPLIED FINISH

HEAT TREATMENT

UNLESS OTHERWISE SPECIFIED

DIMENSIONS ARE IN INCHES

TOLERANCES ON DECIMALS: .X ± .030; .XX ± .020; .XXX ± .010 | ANGLES ± 0° 30'

FORMED ANGLES ± 1.0°

ECCENTRICITY BETWEEN DIA ON THE SAME AXIS SHALL NOT EXCEED .010 TIR.

INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS MIL-D-1000 AND MIL-D-70327

CONTRACT NO.

	NAME	DATE
DR	B. Wood	12/12/67
CHK	J. McGill	1/23/68
APPD	D. Payne	2/1/68

DRN # 770

4-12-68

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

SCHEMATIC - ISOLATED PROGRAMMING

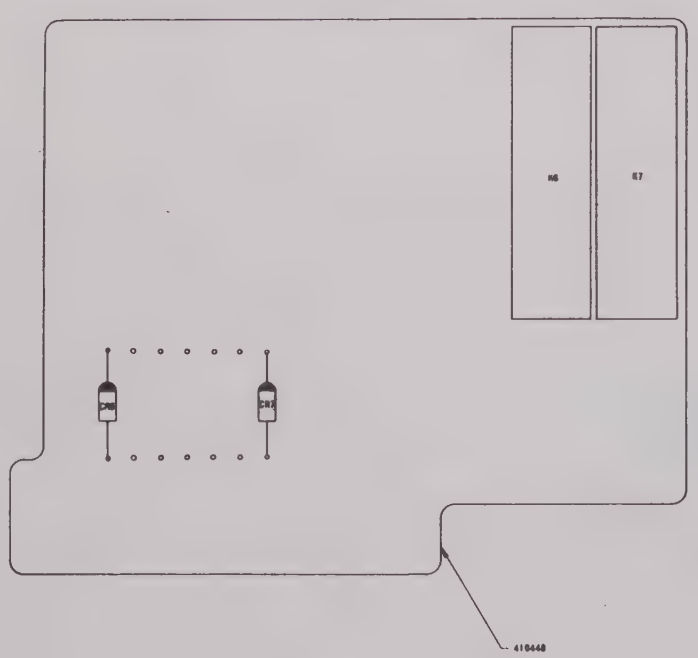
SIZE	CODE IDENT NO.	DWG NO.
C	21793	430747 A

SCALE —— | WT —— | SHEET 1 OF 1

2. ALL DIODES ARE TYPE 018.

1. ALL RELAYS ARE DANA P/N 310017

NOTES: UNLESS OTHERWISE SPECIFIED



REF DES	PART NO	DESCRIPTION
K7	310017	SCI 01-128
K6	310017	SCI 01-128
CR7	211003	018
CR6	211003	018

QTY REQD	SYM	ITEM NO.	GOV'T OR VENDOR NO.	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION

LIST OF MATERIAL OR PARTS LIST

402684	76-02	1	1	
402683	76-01	1	1	
402682	76-02	1	1	
402681	76-01	1	1	
402685	66-02	1	1	
402684	66-01	1	1	
402683	66-02	1	1	
402622	66-01	1	1	
NEXT ASSY	USED ON	NA	FA	
APPLICATION		QTY REQD		

MATERIAL

APPLIED FINISH

HEAT TREATMENT

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON DECIMALS: .X ± .020, .XX ± .010, .XXX ± .005; ANGLES ± 0° 30'
FORMED ANGLES ± 1.0°
ECCENTRICITY BETWEEN DIA ON THE BASE ARE SHALL NOT EXCEED .005 TIR.
INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS MIL-S-1000 AND MIL-D-70327

CONTRACT NO.

	NAME	DATE
DR	[illegible]	11 APR 67
CHK		
APPD	[illegible]	5/1/67

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

PC BOARD ASSEMBLY-
COMMAND AND HOLD

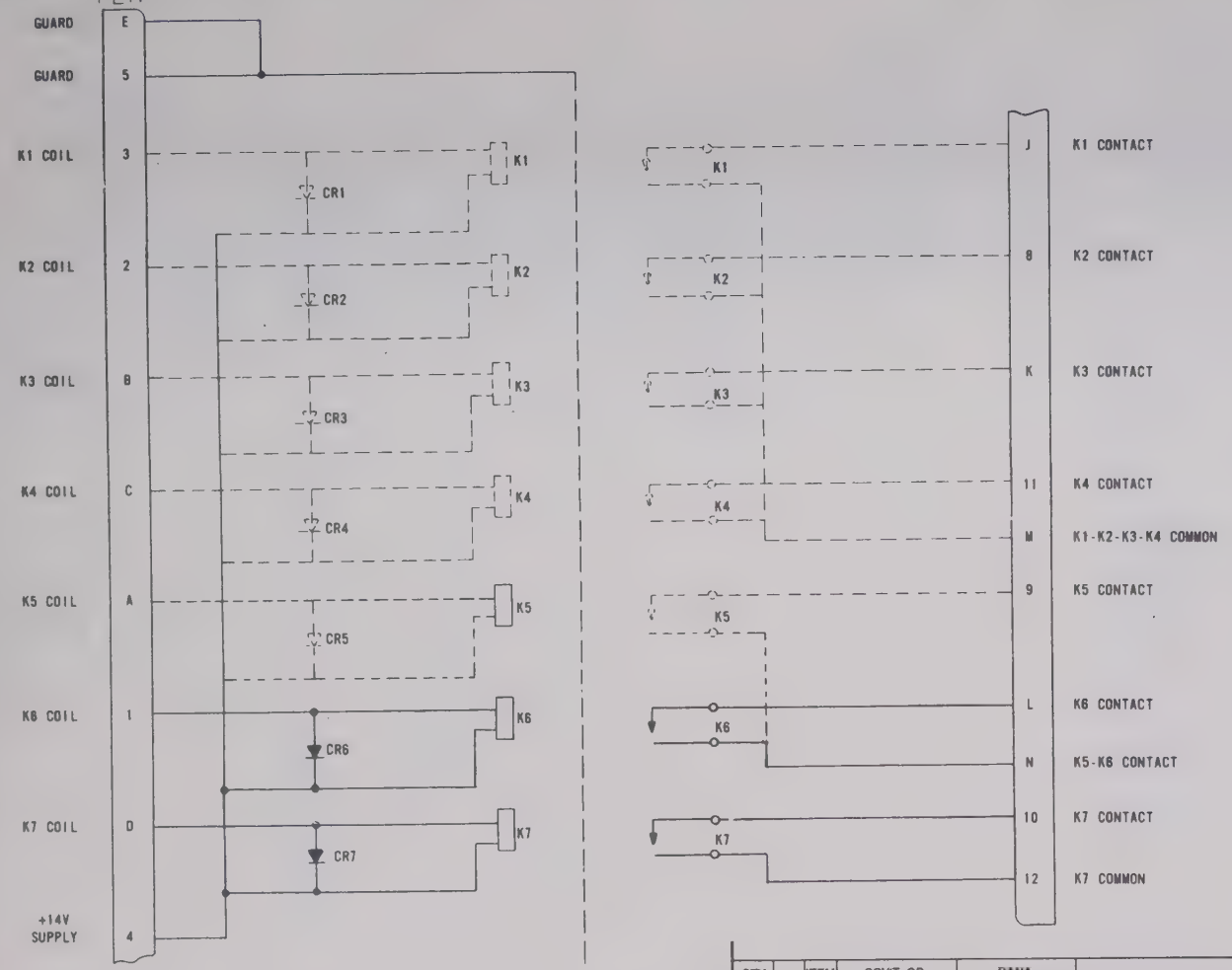
SIZE	CODE IDENT NO.	DWG NO.	
D	21793	402645	A

SCALE 4/1 WT | SHEET 1 OF 1

2. ASSEMBLY PROCEDURES AND PROCESSES TO
COMPLY WITH DANA [illegible] STANDARDS

1. SCHEMATIC REFERENCE: 430748

NOTES: UNLESS OTHERWISE SPECIFIED



QTY REQD	SYM	ITEM NO.	GOV'T OR VENDOR NO.	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION

LIST OF MATERIAL OR PARTS LIST

NEXT ASSY	USED ON	QTY REQD	
402645	66, 76	REF	REF
APPLICATION			

MATERIAL

APPLIED FINISH

HEAT TREATMENT

UNLESS OTHERWISE SPECIFIED

DIMENSIONS ARE IN INCHES

TOLERANCES ON DECIMALS: .X ± .030, .XX ± .020, .XXX ± .010; ANGLES ± 0° 30'

FORMED ANGLES ± 1.0°

ECCENTRICITY BETWEEN DIA ON THE SAME AXIS SHALL NOT EXCEED .010 TIR.

INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS MIL-D-1000 AND MIL-D-70327

CONTRACT NO.

	NAME	DATE
DR	R.H. Wood	21 NOV 1967
CHK	A. Walker	3/4/68
APPD	D. Payne	3/4/68

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

SCHEMATIC- COMMAND AND HOLD

SIZE	CODE IDENT NO.	DWG NO.	
C	21793	430748	A

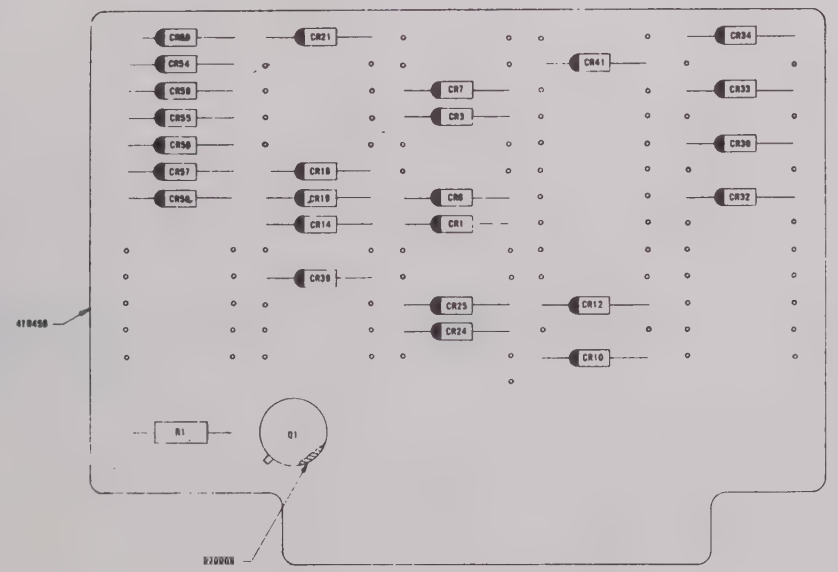
SCALE NONE WT

SHEET 1 OF 1

2. ALL DIODES ARE TYPE 018.

1. ALL RELAYS ARE DANA P/N 310017.

NOTES: UNLESS OTHERWISE SPECIFIED



REF DES	PART NO	DESCRIPTION
Q1	200035	014
R1	000103	10 Ω, 1/4W, 5%

LIST OF MATERIAL OR PARTS LIST

QTY REQD	SYM	ITEM NO	GOV'T OR VENDOR NO.	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION

NEXT ASSY	USED ON	NA	FA
		75-01	/ /
		7-01	/ /
		6-01	/ /
		6-01	/ /
APPLICATION		QTY REQD	

MATERIAL

APPLIED FINISH

HEAT TREATMENT

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
DECIMALS: X ± .030, XX ± .020, XXX ± .010
ANGLES: ± 0° 30'
FORMED ANGLES ± 1°
ECCENTRICITY BETWEEN DIA ON THE SAME AXIS SHALL NOT EXCEED .010 TIR
INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS MIL D 1000 AND MIL D 70327

CONTRACT NO

	NAME	DATE
DR		
CHK		
APPD		

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

BOARD ASSEMBLY-
RANGE AND
FUNCTION CODING, DI

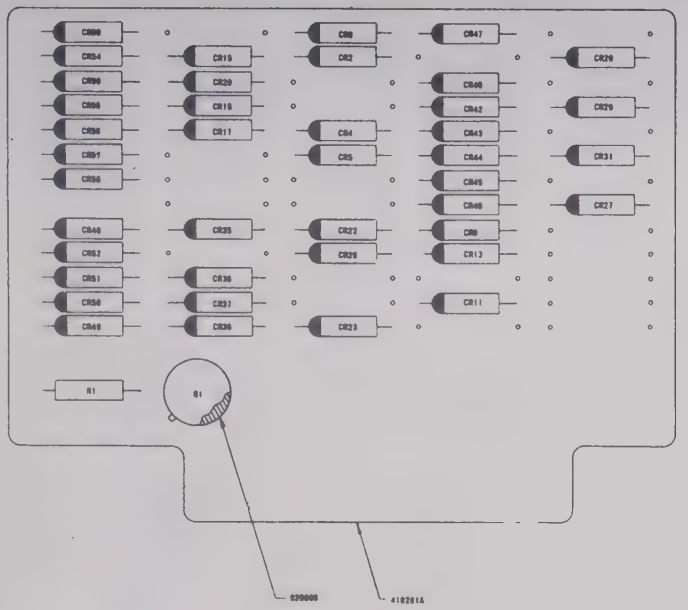
SIZE	CODE IDENT NO	DWG NO.
D	27733	402655

SCALE 1:1 | WT | SHEET 1 OF 1

3. ALL DIODES ARE 810, DANA P/N 211803.
2. ASSEMBLY PROCEDURES AND PROCESSES TO COMPLY WITH DANA WORKMANSHIP STANDARDS.
1. SCHEMATIC REFERENCE: 430451

NOTES: UNLESS OTHERWISE SPECIFIED

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED



REF DES	PART NO.	DESCRIPTION
CR52	211003	010
CR51		
CR58		
CR49		
CR60		
CR47		
CR46		
CR45		
CR44		
CR43		
CR42		
CR40		
CR36		
CR37		
CR38		
CR35		
CR31		
CR29		
CR28		
CR27		
CR26		
CR23		
CR22		
CR20		
CR17		
CR16		
CR15		
CR13		
CR11		
CR9		
CR8		
CR5		
CR4		
CR2	211003	010

REF DES	PART NO.	DESCRIPTION
R1	000103	10 Ω, 1/4, 5%
Q1	200039	014
CR60	211003	010
CR54		
CR58		
CR57		
CR50		
CR56		
CR54	211003	010

QTY REQD	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION OR VENDOR P/N	ITEM NO.
400585	A0075-02				
400577	A0073-02				
400574	A0063-02				
400568	A0033-02				

NEXT ASSY | USED ON | MA | FA

APPLICATION | QTY REQD

LIST OF MATERIAL OR PARTS LIST

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON: DECIMALS ± .005, ANGLES ± 0° 30', FORMED ANGLES ± 1.0

MATERIAL

FINISH

CONTRACT NO.

DRAWN ABBOTT 7/1/82

CHECK Tuft 7/8/82

CODE IDENT Hyde 7/8/82

PROJ ENGR J. Nelson 7/8/82

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

PC BOARD ASSY-RANGE FUNCTION CODING, D2

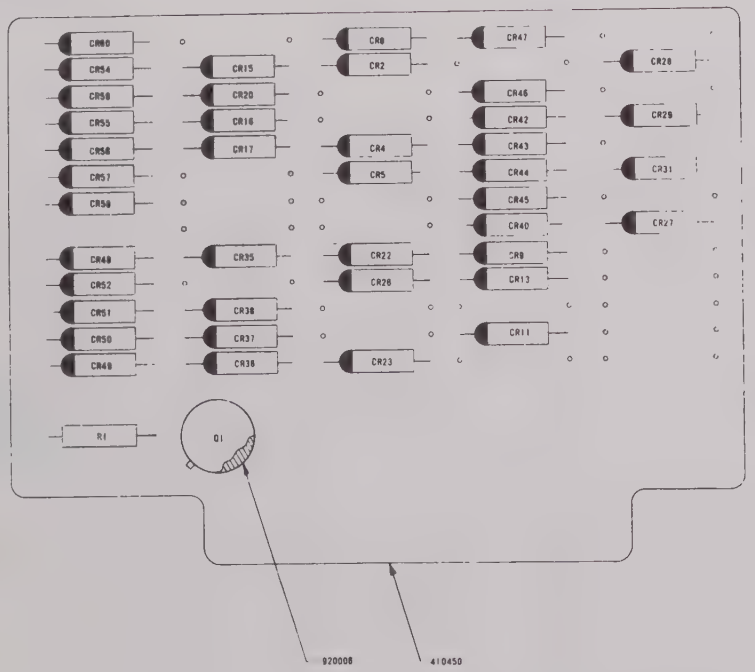
SIZE D | CODE IDENT NO. | DWG NO. 402359 | REV

SCALE 4/1 | WT | SHEET 1 OF 1

2 ASSEMBLY PROCEDURES AND PROCESSES TO CONFORM WITH DANA WORKMANSHIP STANDARDS

1 REFERENCE SCHEMATIC 430501

NOTED UNLESS OTHERWISE SPECIFIED



REF DES	PART NO	DESCRIPTION
CR52	211003	D18
CR51		
CR50		
CR49		
CR48		
CR47		
CR46		
CR45		
CR44		
CR43		
CR42		
CR40		
CR38		
CR37		
CR36		
CR35		
CR31		
CR20		
CR28		
CR27		
CR28		
CR23		
CR22		
CR20		
CR17		
CR16		
CR15		
CR13		
CR11		
CR9		
CR8		
CR5		
CR4		
CR2	211003	D18

REF DES	PART NO	DESCRIPTION
R1	000103	10 K, 1/4, 5%
Q1	200035	D14
CR60	211003	D18
CR59		
CR58		
CR57		
CR56		
CR55		
CR54	211003	D18

QTY REQD	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION OR VENDOR P/N	ITEM NO
1	402657	MOD 8 D2			
1	402658	MOD 16 D2			
1	402659	MOD 32 D2			
1	402660	MOD 64 D2			

LIST OF MATERIAL OR PARTS LIST

NEXT ASSY | USED ON | NA | FA

APPLICATION | QTY REQD

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON DECIMALS: .X ±.030, .XX ±.005, .XXX ±.010
ANGLES 0° 30'
FORMED ANGLES 1.0

MATERIAL

FINISH

CONTRACT NO.

DRAWN 10/19/67
CHECK
COG ENGR
PROJ ENGR 11/1/67

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

PC BOARD ASSY-RANGE FUNCTION CODING, D2

SIZE D | CODE IDENT NO 21793 | DWG NO. 402656 | REV

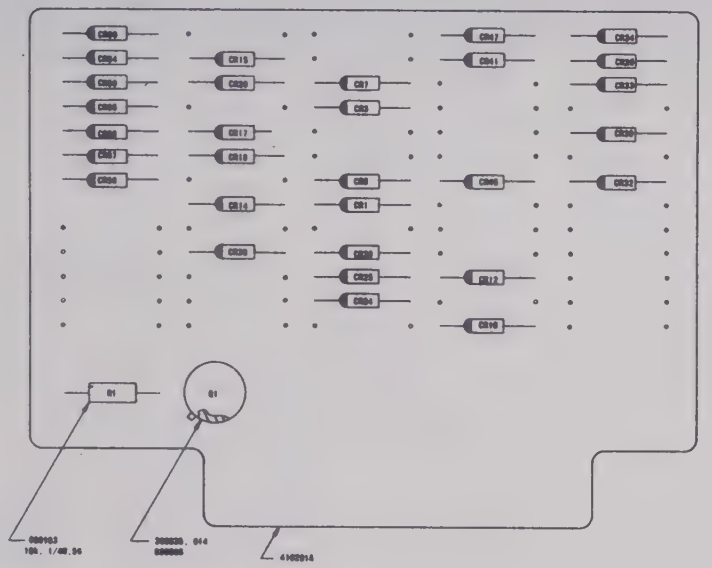
SCALE 4/1 | WT | SHEET 1 OF 1

2. ASSEMBLY PROCEDURES AND PROCESSES TO CONFORM WITH DANA WORKMANSHIP STANDARDS

1 REFERENCE SCHEMATIC 400782

NOTE: UNLESS OTHERWISE SPECIFIED

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED



QTY	PART NUMBER	NOMENCLATURE OR DESCRIPTION	CAGE CODE	SPECIFICATION OR VENDOR P/N	ITEM NO.
		LIST OF MATERIAL OR PARTS LIST			

400509	7-1-61	1	1
400510	7-3-61	1	1
400515	6-5-61	1	1
400567	6-9-61	1	1
NEXT ASSY	USED ON	QTY.	REV.
APPLICATION		QTY REQD	

DANA LABORATORIES INC.
COSTA MESA, CALIFORNIA

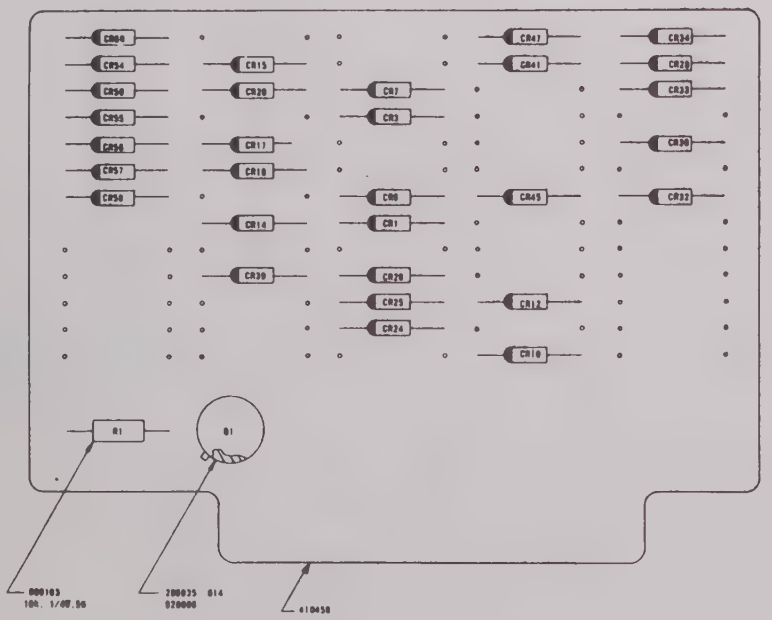
PC BOARD ASSEMBLY-
RANGE AND FUNCTION
CODING, E1

SIZE D | DRAWING NO. 402360 | REV —

SCALE 4/1 | WT — | SHEET 1 OF 1

3. ALL DIODES ARE 010. 0000 P/N 21003
2. SCHEMATIC REFERENCE: 420062
1. ASSEMBLY PROCEDURES AND PROCESSES TO CONFORM WITH DANA WORKMANSHIP STANDARDS.

NOTE: UNLESS OTHERWISE SPECIFIED



QTY REQD	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION OR VENDOR P/N	ITEM NO
		LIST OF MATERIAL OR PARTS LIST			

402658	78-61	1	1
402653	76-61	1	1
402654	67-61	1	10
402614	66-61	1	1
NEXT ASSY	USED ON	NA	FA
APPLICATION		QTY REQD	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON DECIMALS | ANGLES | FORMED ANGLES

MATERIAL

FINISH

CONTRACT NO

DRAWN

CHECK

ENGR

PROJ ENGR

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

PC BOARD ASSEMBLY-
RANGE AND FUNCTION
CODING, EI

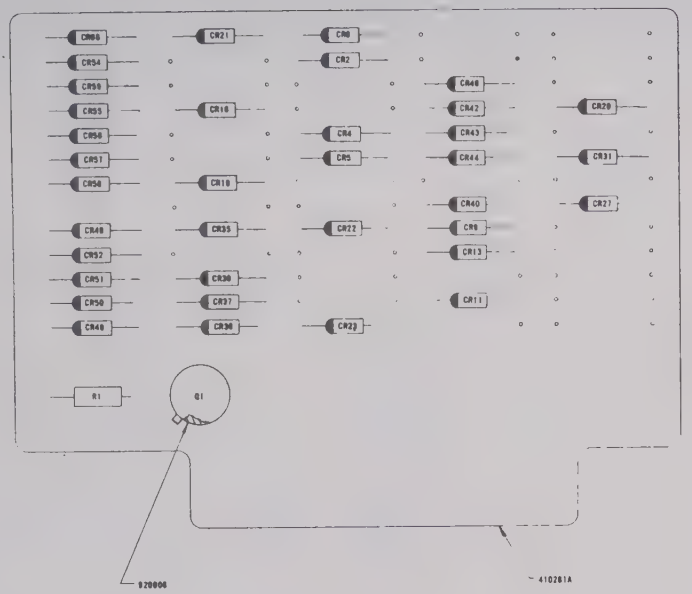
SIZE D | CAGE IDENT NO. 21793 | DWG NO. 402657 | REV

SCALE 4/1 | WT | SHEET 1 OF 1

3. ALL DIODES ARE 010, DANA P/N 311003
2. SCHEMATIC REFERENCE: 418753
1. ASSEMBLY PROCEDURES AND PROCESSES TO CONFORM WITH DANA WORKMANSHIP STANDARDS

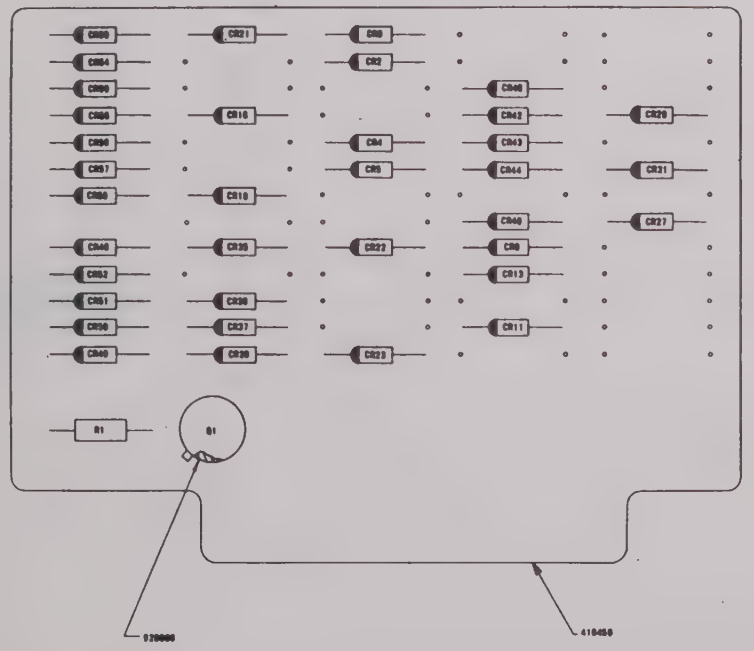
NOTE: UNLESS OTHERWISE SPECIFIED

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED



REF DES	PART NO	DESCRIPTION
CR56	211003	018
CR57		
CR54		
CR55		
CR54		
CR52		
CR51		
CR50		
CR49		
CR48		
CR48		
CR44		
CR43		
CR42		
CR40		
CR38		
CR37		
CR36		
CR35		
CR21		
CR28		
CR27		
CR23		
CR22		
CR21		
CR19		
CR16		
CR13		
CR11		
CR8		
CR8		
CR5		
CR4		
CR2	211003	018

REF DES	PART NO	DESCRIPTION



CR06	211003	010			
CR57	〃	〃			
CR90					
CR96					
CR54					
CR52					
CR51					
CR99					
CR49					
CR48					
CR45					
CR44					
CR43					
CR42					
CR40					
CR39					
CR37					
CR36					
CR29					
CR31					
CR28					
CR27					
CR24					
CR23					
CR22					
CR21					
CR19					
CR18				Q1	000103	10K, 1/4W, 5%
CR12						
CR11						
CR00				Q1	200035	014
CR06						
CR05						
CR04	〃	〃				
CR02	211003	010		CR00	211003	010
REF DES	PART NO.	DESCRIPTION		CR50	211003	010
				REF DES	PART NO.	DESCRIPTION

40.4-1	MYLAR		1
40.434	MYLAR		1
4026-	MYLAR		1
4026-5	MYLAR		1
NEXT ASSY	USED ON	RA	FA
APPLICATION		QTY REQD	

QTY REQD	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION OR VENDOR P/N	ITEM NO.

LIST OF MATERIAL OR PARTS LIST

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON DECIMALS .XX ±.01 .XXX ±.010 | ANGLES 0° 30' | FORMED ANGLES 1.0

MATERIAL

FINISH

CONTRACT NO.

DRAWN A. WONG 1/19/81

CHECK

CODE IDENT

FIRST CASTING 8/1/81 9/16/81

NEXT

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

PC BOARD ASSEMBLY-
RANGE AND
FUNCTION CODING, E2

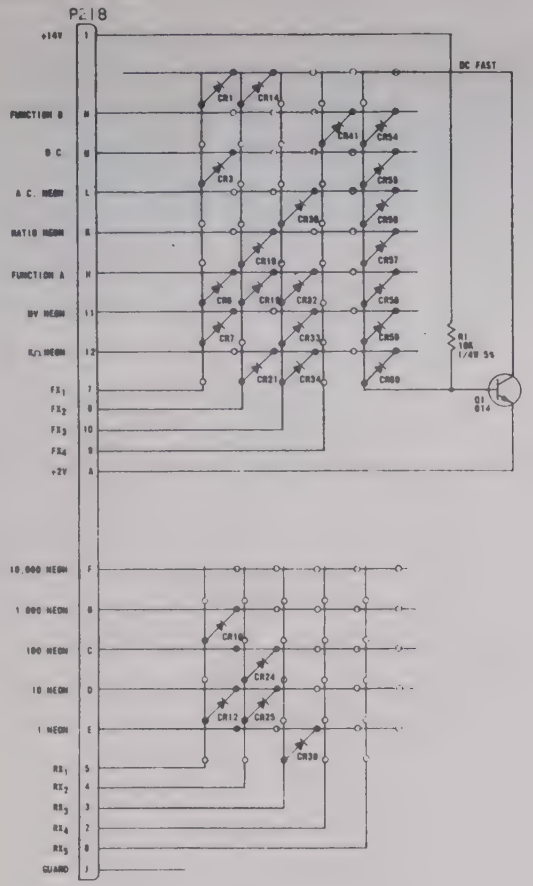
SIZE	CODE IDENT NO.	DWG NO.	REV
D	71793	402658	

SCALE 4/1 | WT | SHEET 1 OF 1

2. ASSEMBLY PROCEDURES AND PROCESSES TO CONFORM WITH DANA WORKMANSHIP STANDARDS.

1. DOMESTIC REFERENCE: 430754

NOTE: UNLESS OTHERWISE SPECIFIED



1 ALL DIODES TO BE TYPE 818

NOTES: UNLESS OTHERWISE SPECIFIED

QTY REQD	SYM	ITEM NO	GOV'T OR VENDOR NO.	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION

LIST OF MATERIAL OR PARTS LIST

NEXT ASSY	USED ON	NA	FA
APPLICATION		QTY REQD	

MATERIAL

APPLIED FINISH

HEAT TREATMENT

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON DECIMALS | ANGLES
.X ± .030 | ± 0° 30'
.XX ± .010
.XXX ± .010
FORMED ANGLES ± 1.0°
ECCENTRICITY BETWEEN DIA ON THE SAME AXIS SHALL NOT EXCEED .010 TIR.
INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS MIL D-1000 AND MIL-D-70327

CONTRACT NO.

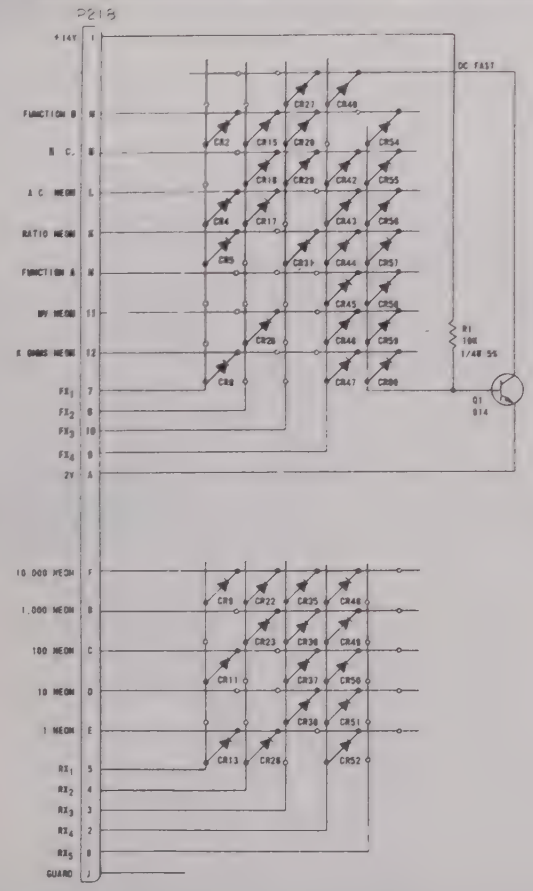
	NAME	DATE
DR	A.Schwoerk	3/1/67
CHK		
APPD		4/1/67

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

SCHEMATIC - RANGE AND FUNCTION CODING, DI

SIZE	CODE IDENT NO.	DWG NO.
D	21793	430751

SCALE NONE | WT | SHEET 1 OF 1



1 ALL DIODES TO BE TYPE 810

NOTE: UNLESS OTHERWISE SPECIFIED

QTY REQD	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION OR VENDOR P/N	ITEM NO.
		LIST OF MATERIAL OR PARTS LIST			

4026S6	TA D2	PER	REF
A026S6	76 D2	REF	REF
A-2696	I.C.D.	REF	PER
4026S6	" "	REF	PER
NEXT ASSY	USED ON	NA	FA
APPLICATION		QTY REQD	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON: DECIMALS: X .030, .XX .020, .XXX .010; ANGLES 0° 30'; FORMED ANGLES 1.0

CONTRACT NO.

MATERIAL

FINISH

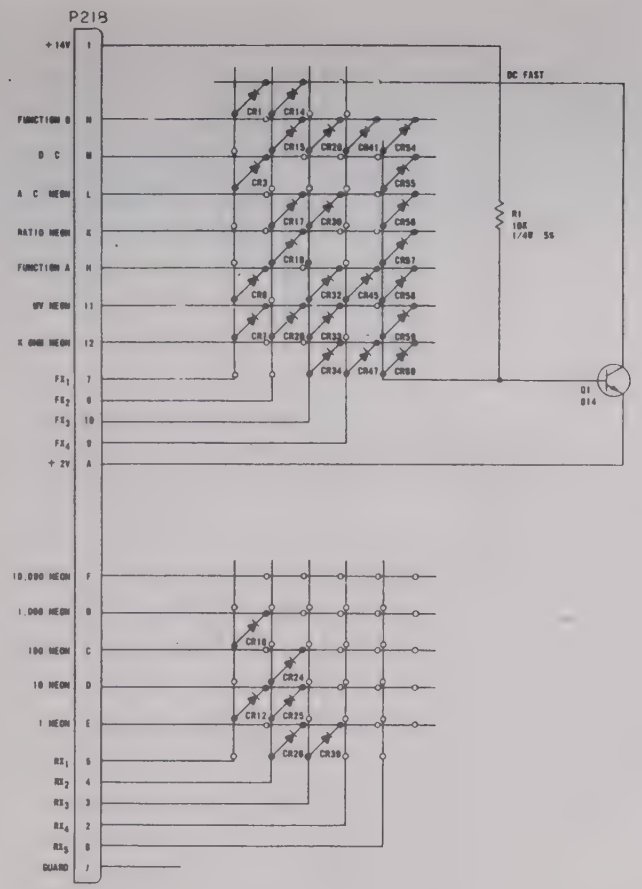
DANA LABORATORIES INC.
IRVINE, CALIFORNIA

DRAWN	R. Smith	12/14/72
CHECK	[illegible]	12/19/72
COG ENGR		
PROJ ENGR	[illegible]	12/16/72

SCHEMATIC-RANGE FUNCTION CODING, D2 (1-24-8 CLOSURE FALSE)

SIZE	CODE IDENT NO	DWG NO	REV
D	21793	430752	

SCALE — WT — SHEET 1 OF 1



1 ALL DIODES TO BE TYPE 810

NOTE: UNLESS OTHERWISE SPECIFIED

QTY REQD	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION OR VENDOR P/N	ITEM NO
		LIST OF MATERIAL OR PARTS LIST			

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON: DECIMALS X .030 XX .010 XXX .005 | ANGLES 0° 30' | FORMED ANGLES 1.0

CONTRACT NO.

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

DRAWN R.Elwood 11/4/63
CHECK
DSG ENGR
PROJ ENGR

MATERIAL

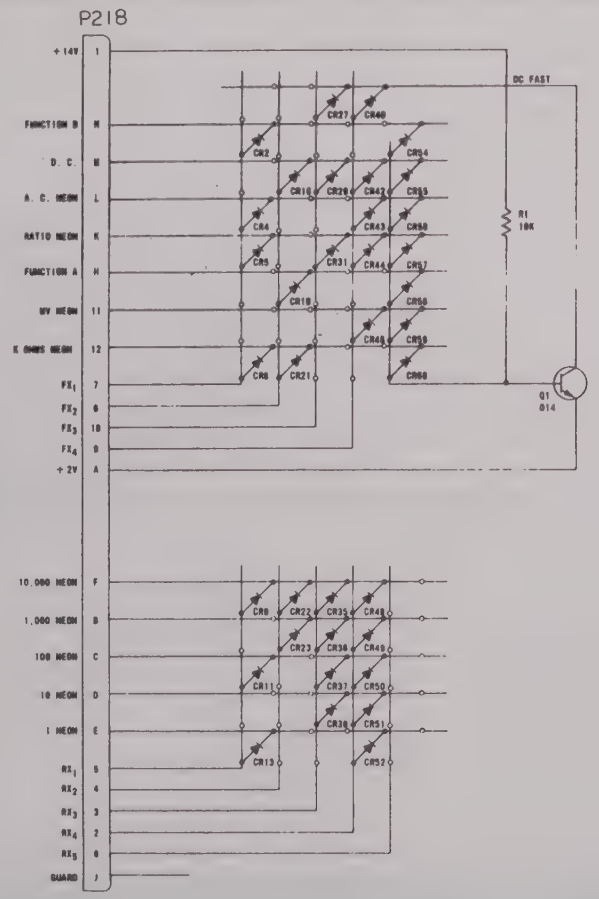
FINISH

SCHEMATIC-
RANGE & FUNCTION CODING,
E(1)(1-2-2-4 CLOSURE TRUE)

SIZE	CODE IDENT NO	DWG NO	REV
D	71193	430753	

SCALE — WT — SHEET 1 OF 1

NEXT ASSY	USED ON	NA	FA
APPLICATION		QTY REQD	



2. ALL RESISTORS ARE 1/4 W, 5%, CARBON
1. ALL DIODES TO BE TYPE 810.

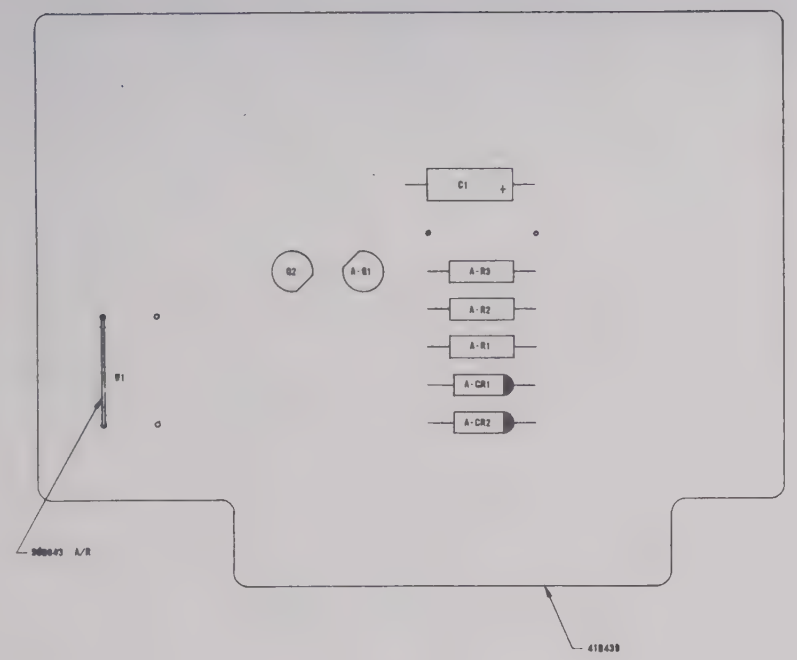
QTY REQD	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION OR VENDOR P/N	ITEM NO.
		LIST OF MATERIAL CR PARTS LIST			

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

SCHEMATIC-
RANGE & FUNCTION CODING
E2(1-2-24 CLOSURE FALSE)

SIZE D | CODE IDENT NO. 27153 | DWG NO 130754 | REV

SCALE — | WT — | SHEET 1 OF 1



R3	000123	12k 1/4W ± 5%
R2	000154	100k 1/4W ± 5%
R1	000243	24k 1/4W ± 5%
Q2	200037	2N3646
Q1	200037	2N3646
CR2	211003	910
CR1	211003	910
C1	110017	10F35V10%
REF DES	PART NO.	DESCRIPTION

2 [illegible]

3 [illegible]

NOTE: UNLESS OTHERWISE SPECIFIED

QTY REQD	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION OR VENDOR P/N	ITEM NO.
		LIST OF MATERIAL OR PARTS LIST			
1	402677	76-D1-E1			1
1	402678	76-D2-E2			1
1	402675	66-D1-E1			1
1	402676	66-D2-E2			1

NEXT ASSY	USED ON	NA	FA
APPLICATION		QTY REQD	

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON:
DECIMALS: .X ±.100, .XX ±.030, .XXX ±.010
ANGLES 0° 30'
FORMED ANGLES ±2°

MATERIAL

FINISH

CONTRACT NO.

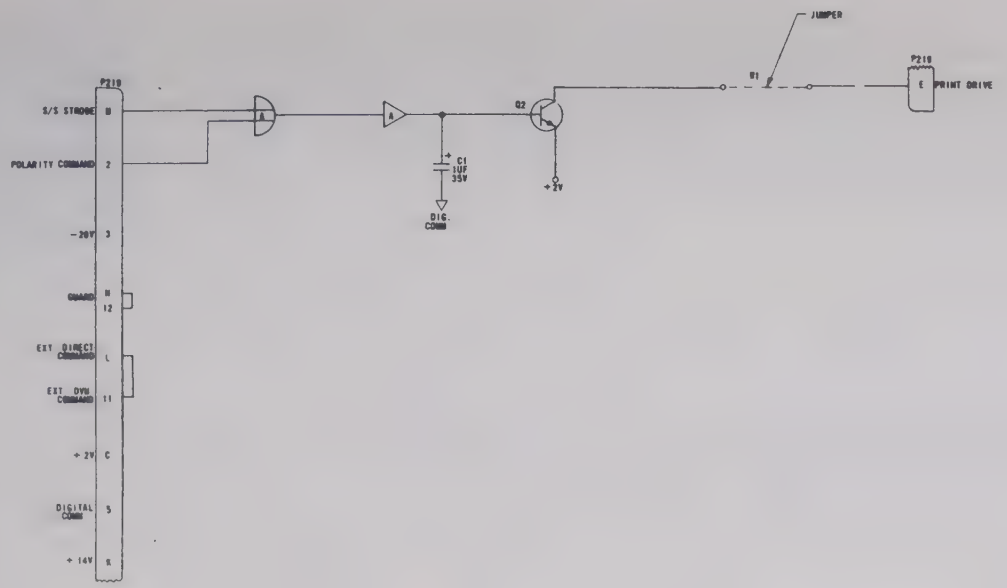
DRAWN GEO. ECKER 10-19-67
CHECK [illegible] 11/6/67
DESIGN
PROJ. ENGR [illegible] 11/7/67

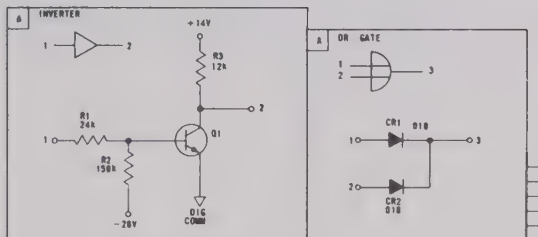
DANA LABORATORIES INC.
IRVINE, CALIFORNIA

P C BOARD ASSY-PRINT
COMMAND LOGIC

SIZE	CODE IDENT NO	DWG NO.	REV
D	21793	402593	A

SCALE 4/1 WT SHEET 1 OF 1





3. HIGHEST REF DESIGNATIONS USED - R3, C1, CR2, Q2, Q1
2. ALL TRANSISTORS 2N3646
1. ALL RESISTORS CARBON, 1/4W ± 5%

UNLESS OTHERWISE SPECIFIED

QTY REQD	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION OR VENDOR P/N	ITEM NO.

LIST OF MATERIAL OR PARTS LIST

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON DECIMALS: X .030, XX .010, XXX .010; ANGLES 0° 30'; FORMED ANGLES 1.0

MATERIAL

FINISH

CONTRACT NO.

DRAWN GEO. ECKER 7/1/--
CHECK 7/14/--
DESIGN
PROJ ENGR

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

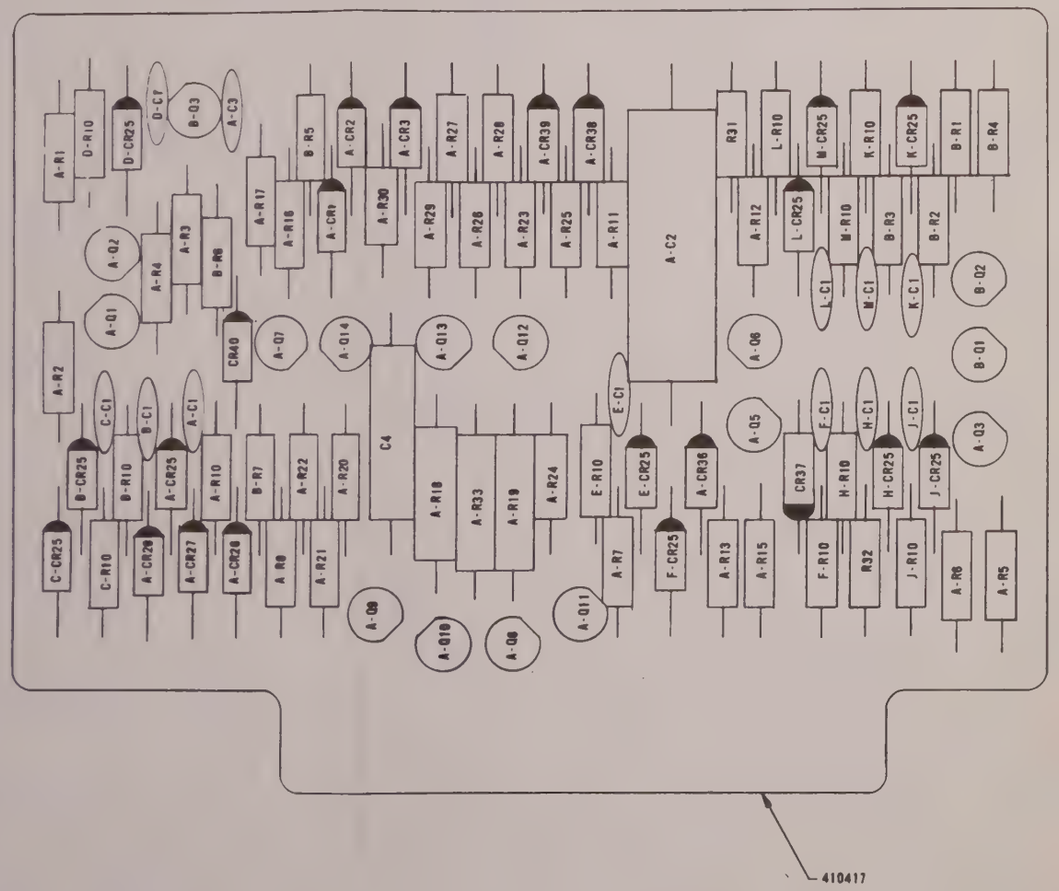
SCHEMATIC-
PRINT COMMAND
LOGIC

SIZE	CODE IDENT NO	DWG NO	REV
D	21793	430718	

SCALE NI SHEET 1 OF 1

4c2513.		ANDF	ANDF
NEXT ASSY	USED ON	NA	FA
APPLICATION		QTY REQD	

REVISIONS				
LTR	DESCRIPTION	DR	CHK	APPD
A	REVISED PER EO 2635	J.M.E 7-16-68		
B	REVISED PER E.O. 4549	GEORGE 8-19-69	CONTROL	
C	EC1-FC1 WERE 100 PF E.O. 5530	CONTROL 1-28-70		
D	EC1-FC1 WERE 220 PF E.O. 5913	CONTROL 9-1-70		



410417

REF DES	PART NO	DESCRIPTION
Q14	200037	2N3646
Q13	200043	2N3585
Q12	↕	↕
Q11		
Q10	↓	↓
Q9	200043	2N3585
Q8	200022	012
Q7	200037	2N3646
Q6	↕	↕
Q5		
Q3		
Q2	↓	↓
Q1	200037	2N3646
CR40	211083	018
CR39	220007	1N751
CR38	220004	1N961B
CR37	220004	1N961B
CR36	211083	018
CR28	↕	↕
CR27		
CR26		
CR25		
CR3		
CR2	↓	↓
CR1	211083	018
C4	120173	0.1UF100V
C3	100017	.01UF/DISC
C2	120003	0.1UF-100V±10%
K-C1	101145	100 pF DISC
F-C1	101098	330pF/DISC
E-C1	101098	330pF/DISC
C1	101182	47pF/DISC

	410417	PC BOARD
R33	011332	1k1/4W ±1%
R32	000243	24k1/4W ±5%
R31	000243	24k1/4W ±5%
R30	000822	8.2k1/4W ±5%
R29	000243	24k1/4W ±5%
R28	000123	12k1/4W ±5%
R27	000473	47k1/4W ±5%
R26	000683	68k1/4W ±5%
R25	000331	330 1/4W ±5%
R24	000333	33 k1/4W ±5%
R23	000123	12k1/4W ±5%
R22	000822	8.2k1/4W ±5%
R21	000154	150k1/4W ±5%
R20	000243	24k1/4W ±5%
R19	010333	464k1/4W ±1%
R18	011332	1k1/4W ±1%
R17	000822	8.2k1/4W ±5%
R16	000563	56k1/4W ±5%
R15	000104	100k1/4W ±5%
R13	000222	2.2k1/4W ±5%
R12	000123	12k1/4W ±5%
R11	000123	12k1/4W ±5%
R10	000273	27k1/4W ±5%
R8	000123	12k1/4W ±5%
R7	000154	150k1/4W ±5%
R6	000243	24k1/4W ±5%
R5	000123	12k1/4W ±5%
R4	000153	15k1/4W ±5%
R3	000822	8.2k1/4W ±5%
R2	000153	15k1/4W ±5%
R1	000822	8.2k1/4W ±5%

REF DES	PART NO	DESCRIPTION

2. ALL RESISTER VALUES ARE IN OHMS
1. ASSEMBLY PROCEDURES AND PROCESSES TO CONFORM WITH DANA WORKMANSHIP STANDARDS

NOTE: UNLESS OTHERWISE SPECIFIED

NEXT ASSY	USED ON	NA	FA
APPLICATION		QTY REQD	
402677	77	1	1
402676	68-E2	1	1
402675	68-E1	1	1
402674	68-D2	1	1
402675	68-D1	1	1
402678	78-E2	1	1
402677	78-E1	1	1
402678	78-D2	1	1
402677	78-D1	1	1
402675	67	1	1

QTY REQD	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION OR VENDOR P/N	ITEM NO.

LIST OF MATERIAL OR PARTS LIST

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON: DECIMALS X .030 XX .020 XXX .010 | ANGLES 0° 30' | FORMED ANGLES 1.0

MATERIAL

FINISH

CONTRACT NO.

DRAWN	GEO. ECKER	11/2/67
CHECK		11/3/67
DESIGN		
PROJ ENGR		11/6/67

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

P C BOARD ASSY-PROGRAMMING COMMAND LOGIC

SIZE	CODE IDENT NO.	DWG NO.	REV
D	21793	402513	D

SCALE 4/1 | WT | SHEET 1 OF 1

REVISIONS				
LTR	DESCRIPTION	DR	CHK	APPD
A	ECI FCI WERE 100 PF, ED. 5530	CARROLL 1-29-70		
B	ECI-FCI WERE 220PF, ED. 5913	CARROLL 9-2-70		

P219

POLARITY COMMAND 2
0 1
9 A
EXT DELAYED COMMAND 8
EXT. DIRECT L
+14V K
−28V 3
DIGITAL COM 5
GUARD 12
N
S/S STROBE H
EXT CAP D

+14V R31 24k
+14V R32 24k
DIG.COM
DIG COM

CR46

P219
4 PRINT
11 EXTERNAL DVM COMMANDS

M DYNAMIC AND GATE
R10 27k
CR25
C1 47pF Δ8

A OR GATE
CR26
CR27 THRU CR35

B INVERTER
+14V
R5 12k
R6 24k
R7 150k
Q3
−28V
DIG. COM.

A AND GATE
+14V
R9 12k
CR1
CR2 THRU CR12

A DELAY GENERATOR
R19 464k ±1%
R25 330Ω
CR30 1N9618
R23 12k
R30 8.2k
OUTPUT
R33 1k ±1%
R18 1k ±1%
C4 .1 UF 100V
DIG. COM
EXT. CAP.
Q8 Q12
Q11 2N3565
Q12 2N3565
Q14
Q13 2N3565
R22 8.2k
Q10 2N3565
R24 33k
R28 68k
R29 24k
R27 47k
R20 24k
INPUT 1
R21 150k
Q9 2N3565
CR39 1N751
R26 12k
DIG. COM.

A DELAYED INVERTER
+14V
R17 8.2k
Q7
R16 56k
C3 .01
DIG. COM.

A ONE SHOT
+14V
R11 15k
R12 15k
R13 8.2k
C2 10pF

B FLIP FLOP
+14V
R1 8.2k
R2 10k
R3 8.2k
R4 15k

Δ8 C1 FOR E-F, SHALL BE 330PF
C1 FOR K, SHALL BE 100 PF.
5. ELEMENT REFERENCE DESIGNATORS NOT USED: CR, CR40, R33, Q14
4. REFERENCE DESIGNATORS NOT USED: TB4 THRU 24, R8, R4, CR28 THRU 46
3. ALL TRANSISTORS 2N3640
2. ALL DIODES 540
1. ALL RESISTORS, WATTAGE, 1/4W 5%
NOTE: UNLESS OTHERWISE SPECIFIED

QTY REQD	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION OR VENDOR P/N	ITEM NO.

LIST OF MATERIAL OR PARTS LIST

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON: DECIMALS X .030 .XX .020 .XXX .010 ANGLES 0° 30' FORMED ANGLES 1.0
MATERIAL
FINISH

CONTRACT NO.

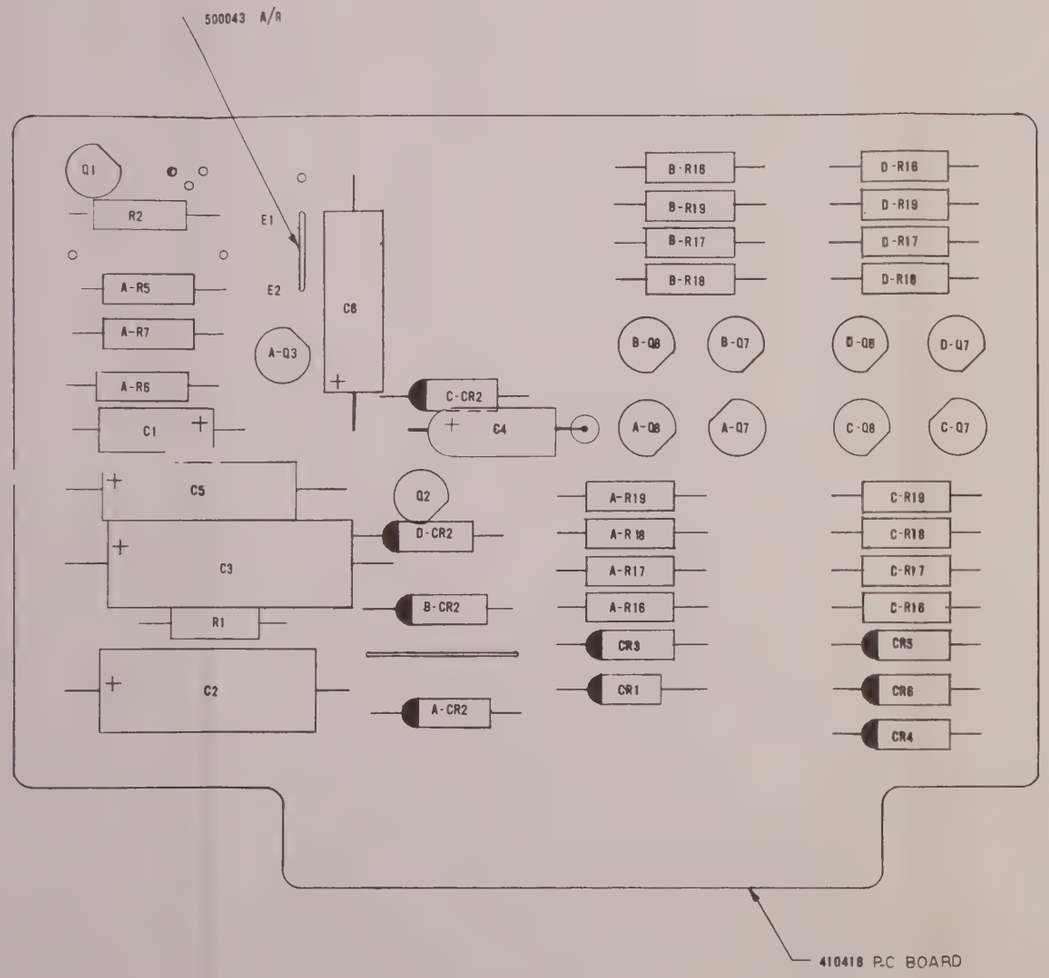
DRAWN	G WILSON	8/7/67
CHECK	J. Gratone	8/15/67
DESIGN		
PROJ ENGR	D Penn	8/16/67

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

SCHEMATIC—PROGRAMMING COMMAND LOGIC

SIZE	CODE IDENT NO.	DWG NO.
D	21793	430691

SCALE — WT — SHEET



REF DES OR ITEM	P/N	DESCRIPTION	QTY
R1	000123	12k 1/4W 5%	3
R2	000562	5.6k 5%	1
R5	000123	12k 5%	REF
R6	000243	24k 5%	2
R7	000154	150k 5%	1
R16	000822	8.2k 5%	1
R17	000243	24k 5%	REF
R18	000104	100k 1/4W 5%	1
R19	000123	12k 1/4W 5%	REF
C1	110017	1UF 35V 10%	2
C2	110017	1UF 35V 10%	REF
C3	110023	2.2UF 35V 10%	1
C4	110102	1.2UF 35V 10%	1
C5	110028	1.5UF 35V 10%	1
C6	120003	0.1UF 100V 10%	1
CR1	210004	SD4	5
CR2	211236	007	1
CR3	210004	SD4	REF
CR4	〃	〃	〃
CR5	〃	〃	〃
CR6	210004	SD4	REF
Q1	200037	2N3646	4
Q2	200037	2N3646	REF
Q3	〃	〃	〃
Q7	200037	2N3646	REF
Q8	200043	2N3565	1

REF DES OR ITEM	P/N	DESCRIPTION	QTY
	410418	PC BOARD	1
	500043	WIRE 24 GA	A/R

3. SCHEMATIC REF: 430719
2. ALL RESISTER VALUES ARE IN OHMS
1. ASSEMBLY PROCEDURES AND PROCESSES TO CONFORM WITH DANA WORKMANSHIP STANDARDS

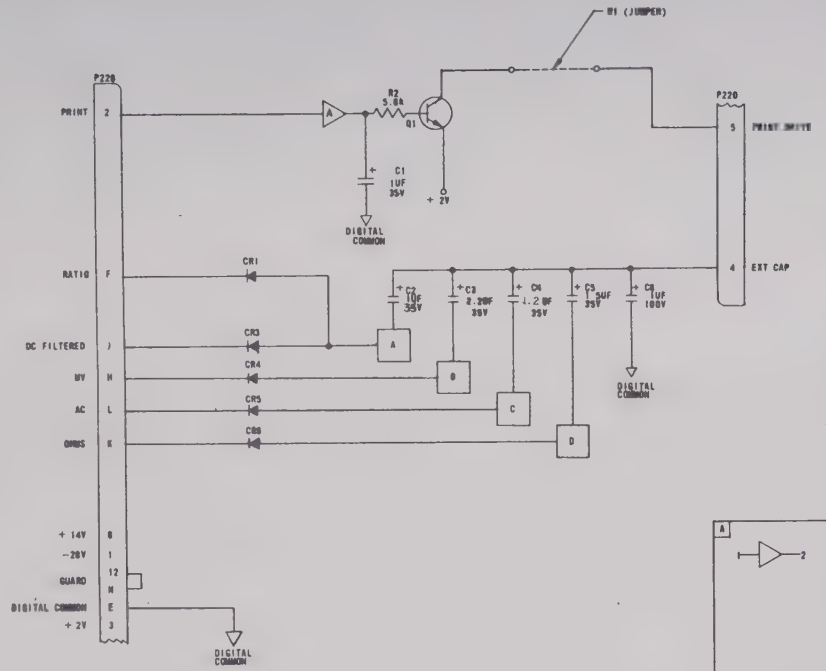
NOTE: UNLESS OTHERWISE SPECIFIED

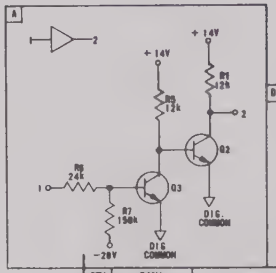
DANA LABORATORIES INC.
IRVINE, CALIFORNIA

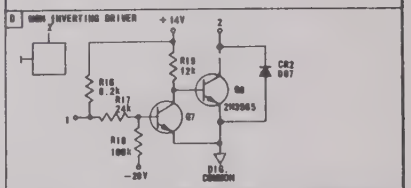
P C BOARD ASSY- FUNCTION DELAY

SIZE	CODE IDENT NO.	DWG NO.	REV
D	21793	402594	E

SCALE 4/1 | WT | SHEET 1 OF 1







QTY REQD	DANA PART NUMBER	NOMENCLATURE OR DESCRIPTION	CODE IDENT	SPECIFICATION OR VENDOR P/N	ITEM NO.
		LIST OF MATERIAL OR PARTS LIST			

5. HIGHEST REFERENCE DESIGNATOR USED:
C8 CR8 Q8 R19 W1
4. REFERENCE DESIGNATORS NOT USED:
Q6 THRU Q8, R4 & R9 THRU R13
3. ALL TRANSISTERS ARE 2N3646
2. ALL DIODES ARE SD4
1. ALL RESISTERS ARE VALUED IN OHMS

NOTE: UNLESS OTHERWISE SPECIFIED

402594	77.78	1ST	REF
NEXT ASSY	USED ON	NA	FA
APPLICATION		QTY REQD	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON: DECIMALS X .020 XX .010 XXX .010 | ANGLES 0° 30' | FORMED ANGLES ±.5

MATERIAL

FINISH

CONTRACT NO.

DRAWN G WILSON 8/17/67
CHECK 8/17/67
DESIGN 8/17/67
PROJ ENGR

DANA LABORATORIES INC.
IRVINE, CALIFORNIA

SCHEMATIC — FUNCTION DELAY

SIZE	CODE IDENT NO.	DWG NO.	REV
D	21793	430719	B

SCALE — WT — SHEET 1 OF 1

PARTS LIST

ASSEMBLY 402553 - Assembly, Control and Attenuator - Model 5500-112/130

REF. DESIG.	PART NO.	DESCRIPTION					
K1	310029	RELAY					AM ZETTLR AZ420-56
K2	310029	RELAY					AM ZETTLR AZ420-56
K3	310030	RELAY	DC	4 PDT	28V	1	PARELCO INR10-E046'
K4	310029	RELAY					AM ZETTLR AZ420-56
K5	310029	RELAY					AM ZETTLR AZ420-56
K7	310029	RELAY					AM ZETTLR AZ420-56
K8	310011	RELAY	DC	2 PDT	26V		BABCOCK BR16-1250B2
C10	120007	CAP	MYLAR	.22 MFD	600 V	20%	ELEC CUBE 210B1F224
C11	121146	CAP	MYLAR	.0047 MFD	100V	10%	CDE WMF1D47
R25	010349	RES	METAL	237 K	1%	1/4W	ELECTRA RN60D2373F
R26	010164	RES	METAL	887 K	1%	1 W	ELECTRA RN70D8873F
R53	040089	RES	VARI	200 K			BOURNS 30525-1-204M
R54	000104	RES	CARBON	100 K	5%	1/4 W1	OHMITE RC07GF104J

PARTS LIST

ASSEMBLY 402031 – ATTENUATOR – Model 5500-112/130

REF DES	PART NO.	DESCRIPTION							
C12	120089	CAP	MYLAR	4.7 MFD	60 V	10%		IONETICS	1047-60
C13	120089	CAP	MYLAR	4.7 MFD	60 V	10%		IONETICS	1047-60
CR81	211236	DIODE	SILICO		007			DANA	211236
CR82	211236	DIODE	SILICO		007			DANA	211236
R27	010020	RES	METAL	4.99 K		1%	1/4W	ELECTRA	RN60D4991F
R28	020124	RES	WW	MATCH SET				DANA	020124
R29	010165	RES	METAL	806 K		1%	1/2W	ELECTRA	RN65D8063F
R30	020124	RES	WW	MATCH SET				DANA	020124
R31	020241	RES	WW	10 K		.05%	1/8W	JORDAN	J-11
R32	020241	RES	WW	10 K		.05%	1/8W	JORDAN	J-11
R33	010020	RES	METAL	4.99 K		1%	1/4W	ELECTRA	RN60D4991F
R34	040033	RES	VARI	1 K		10%	1 W	TECHNO	20
R35	020124	RES	WW	MATCH SET				DANA	020124
R36	040033	RES	VARI	1 K		10%	1 W	TECHNO	20
R37	000823	RES	CARBON	82 K		5%	1/4W	OHMITE	RC07GF823J
R38	000154	RES	CARBON	150 K		5%	1/4W	OHMITE	RC07GF154J
R39	000824	RES	CARBON	820 K		5%	1/4W	OHMITE	RC07GF824J
R40	000153	RES	CARBON	15 K		5%	1/4W	OHMITE	RC07GF153J
R41	010161	RES	METAL	110 OHM		1%	1/4W	ELECTRA	RN60D1100F
R42	020204	RES	WW	1.1111 K		.05%	1/8W	JORDAN	J-11
R43	020170	RES	WW	100.83 OHM		.05%	1/8W	KELVIN	EP-20
R44	040053	RES	VARI	5 K		10%	1.5 W	CTS	110
R45	040053	RES	VARI	5 K		10%	1.5 W	CTS	110
R55	000204	RES	CARBON	200 K		5%	1/4W	OHMITE	RC07GF204J

PARTS LIST

ASSEMBLY 402954 - Model 5500-112/130

REF. DESIG.	PART NO.	DESCRIPTION						
A-C03	120168	CAP	POLYS	.039 MFD	200 V		ELPAC	PD2A393J
B-C03	121393	CAP	MYLAR	.22 MFD	100 V	10%	CDE	WMF1P22
A-C04	120168	CAP	POLYS	.039 MFD	200 V		ELPAC	PD2A393J
B-C04	120026	CAP	MYLAR	.47 MFD	100 V	10%1	IMB	AS2B474K
A-C05	120169	CAP	POLYS	.078 MFD	50 V		IMB	PY2A783J
B-C05	120026	CAP	MYLAR	.47 MFD	100 V	10%1	IMB	AS2B474K
A-C06	101182	CAP	CERAM	47 PFD	500 V	10%1	AEROVOX	TCD-N750
B-C06	101182	CAP	CERAM	47 PFD	500 V	10%1	AEROVOX	TCD-N750
C07	110043	CAP	ELECT	25 MFD	25 V	20%	DUCATI	25-25
C08	110043	CAP	ELECT	25 MFD	25 V	20%	DUCATI	25-25
C09	110044	CAP	ELECT	50 MFD	50 V	20%	DUCATI	50-50
A-CR01	211083	DIODE	SILICO	018		1	DANA	211083
B-CR01	211083	DIODE	SILICO	018		1	DANA	211083
A-CR02	211083	DIODE	SILICO	018		1	DANA	211083
B-CR02	211083	DIODE	SILICO	018		1	DANA	211083
B-CR03	211083	DIODE	SILICO	018		1	DANA	211083
B-CR04	211083	DIODE	SILICO	018		1	DANA	211083
CR37	211083	DIODE	SILICO	018		1	DANA	211083
CR38	211083	DIODE	SILICO	018		1	DANA	211083
CR39	210004	DIODE	SILICO	SD4			DIODES IN SD4	
CR40	210004	DIODE	SILICO	SD4			DIODES IN SD4	
CR41	210004	DIODE	SILICO	SD4			DIODES IN SD4	
CR42	210004	DIODE	SILICO	SD4			DIODES IN SD4	
CR43	210004	DIODE	SILICO	SD4			DIODES IN SD4	
CR44	210004	DIODE	SILICO	SD4			DIODES IN SD4	
CR45	210004	DIODE	SILICO	SD4			DIODES IN SD4	
CR46	210004	DIODE	SILICO	SD4			DIODES IN SD4	
CR47	210004	DIODE	SILICO	SD4			DIODES IN SD4	
CR48	210004	DIODE	SILICO	SD4			DIODES IN SD4	
CR49	210004	DIODE	SILICO	SD4			DIODES IN SD4	
CR50	210004	DIODE	SILICO	SD4			DIODES IN SD4	
CR51	211083	DIODE	SILICO	018		1	DANA	211083
CR52	211083	DIODE	SILICO	018		1	DANA	211083
CR53	211083	DIODE	SILICO	018		1	DANA	211083
CR54	211083	DIODE	SILICO	018		1	DANA	211083
CR55	211083	DIODE	SILICO	018		1	DANA	211083
CR56	211083	DIODE	SILICO	018		1	DANA	211083
CR57	211083	DIODE	SILICO	018		1	DANA	211083

PARTS LIST

ASSEMBLY 402954 - Model 5500-112/130 A

REF. DESIG.	PART NO.	DESCRIPTION						
CR58	211083	DIODE	SILICO	018	1	DANA	211083	
CR59	211083	DIODE	SILICO	018	1	DANA	211083	
CR60	211083	DIODE	SILICO	018	1	DANA	211083	
CR61	211083	DIODE	SILICO	018	1	DANA	211083	
CR62	211083	DIODE	SILICO	018	1	DANA	211083	
CR63	211083	DIODE	SILICO	018	1	DANA	211083	
CR64	211083	DIODE	SILICO	018	1	DANA	211083	
CR65	211083	DIODE	SILICO	018	1	DANA	211083	
CR66	211083	DIODE	SILICO	018	1	DANA	211083	
CR67	211083	DIODE	SILICO	018	1	DANA	211083	
CR68	211083	DIODE	SILICO	018	1	DANA	211083	
CR69	211083	DIODE	SILICO	018	1	DANA	211083	
CR70	211083	DIODE	SILICO	018	1	DANA	211083	
CR71	211083	DIODE	SILICO	018	1	DANA	211083	
CR72	220044	DIODE				MOTOROLA	1N821	
CR73	211083	DIODE	SILICO	018	1	DANA	211083	
CR74	211083	DIODE	SILICO	018	1	DANA	211083	
CR75	210004	DIODE	SILICO	SD4		DIODES IN SD4		
CR76	210004	DIODE	SILICO	SD4		DIODES IN SD4		
CR77	210004	DIODE	SILICO	SD4		DIODES IN SD4		
CR78	210004	DIODE	SILICO	SD4		DIODES IN SD4		
CR79	211083	DIODE	SILICO	018	1	DANA	211083	
CR80	211083	DIODE	SILICO	018	1	DANA	211083	
K06	310013	RELAY	REED	SPST 24V	1	WHEELOCK	2961A X6	
A-Q07	200104	TRANS	SILICO	MPS-6571		MOTOROLA	MPS-6571	
B-Q07	200104	TRANS	SILICO	MPS-6571		MOTOROLA	MPS-6571	
A-Q08	200104	TRANS	SILICO	MPS-6571		MOTOROLA	MPS-6571	
B-Q08	200104	TRANS	SILICO	MPS-6571		MOTOROLA	MPS-6571	
A-Q09	200043	TRANS	SILICO NPN	2N3565		FAIRCHILD	2N3565	
B-Q09	200043	TRANS	SILICO NPN	2N3565		FAIRCHILD	2N3565	
A-Q10	200043	TRANS	SILICO NPN	2N3565		FAIRCHILD	2N3565	
B-Q10	200043	TRANS	SILICO NPN	2N3565		FAIRCHILD	2N3565	
C11	200035	TRANS	SILICO NPN	014		DANA	200035	
C12	200035	TRANS	SILICO NPN	014		DANA	200035	
C13	200079			021		DANA	200079	
C14	200079			021		DANA	200079	
C15	200022	TRANS	SILICO PNP	012		DANA	200022	
A-R08	000473	CAP	CARBON	47 K	5% 1/4 W1	OHMITE	RC07GF473J	

PARTS LIST

ASSEMBLY 402954 - Model 5500-112/130

A

REF. DESIG.	PART NO.	DESCRIPTION						
A-R16	010348	RES	METAL	536 K	1%		CORNING	RN60 B
B-R16	000433	RES	CARBON	43 K	5%	1/4 W	OHMITE	RC07GF433J
A-R17	000514	RES	CARBON	510 K	5%	1/4 W1	OHMITE	RC07GF524J
B-R17	000514	RES	CARBON	510 K	5%	1/4 W1	OHMITE	RC07GF524J
A-R18	000205	RES	CARBON	2 M	5%	1/4 W1	OHMITE	RC07GF205J
B-R18	000205	RES	CARBON	2 M	5%	1/4 W1	OHMITE	RC07GF205J
A-R19	000912	RES	CARBON	9.1 K	5%	1/4 W1	OHMITE	RC07GF912J
B-R19	000912	RES	CARBON	9.1 K	5%	1/4 W1	OHMITE	RC07GF912J
A-R20	010348	RES	METAL	536 K	1%		CORNING	RN60 B
B-R20	000433	RES	CARBON	43 K	5%	1/4 W	OHMITE	RC07GF433J
A-R21	010348	RES	METAL	536 K	1%		CORNING	RN60 B
B-R21	000433	RES	CARBON	43 K	5%	1/4 W	OHMITE	RC07GF433J
R22	000101	RES	CARBON	100 OHM	5%	1/4 W1	OHMITE	RC07GF101J
R23	000362	RES	CARBON	3.6 K	5%	1/4 W1	OHMITE	RC07GF362J
R24	000820	RES	CARBON	82 OHM	5%	1/4 W	OHMITE	RC07GF820J
R52	000102	RES	CARBON	1 K	5%	1/4 W1	OHMITE	RC07GF102J
S01	600416	SWITCH		1 P7P			CTS FCT RGE	
S02	600415	SWITCH		1 P 7P				

PARTS LIST

ASSEMBLY 402441 - **PC Board Assembly, Attenuator,** - Model 5500-112/130

REF. DESIG.	PART NO.	DESCRIPTION						
C9	120089	CAP	MYLAR	4.7 MFD	60 V	10%	IONETICS	1047-60
C10	120089	CAP	MYLAR	4.7 MFD	60 V	10%	IONETICS	1047-60
R12	010020	RES	METAL	4.99 K	1%	1/4 W	ELECTRA	RN60D4991F
R13	010020	RES	METAL	4.99 K	1%	1/4 W	ELECTRA	RN60D4991F
R14	020124	RES	WW	MATCH SET			DANA	020124
R15	040033	RES	VARI	1 K	10%	1 W	TECHNO	20
R16	020124	RES	WW	MATCH SET			DANA	020124
R17	010165	RES	METAL	806 K	1%	1/2 W1	ELECTRA	RN65D8063F
R18	020124	RES	WW	MATCH SET			DANA	020124
R19	040033	RES	VARI	1 K	10%	1 W	TECHNO	20
R20	010161	RES	METAL	110 OHM	1%	1/4 W	ELECTRA	RN60D1100F
R21	020204	RES	WW	1.1111 K	.05%	1/8 W	JORDAN	J-11
R22	020241	RES	WW	10 K	.05%	1/8 W	JORDAN	J-11
R23	020170	RES	WW	100.83 OHM	.05%	1/8 W	KELVIN	EP-20
R24	000823	RES	CARBON	82 K	5%	1/4 W1	OHMITE	RC07GF823J
R25	020241	RES	WW	10 K	.05%	1/8 W	JORDAN	J-11
R26	000154	RES	CARBON	150 K	5%	1/4 W1	OHMITE	RC07GF154J
R27	040050	RES	VARI	5 K	10%	1/2 W	BOURNS	3067-P-1-K0
R28	000824	RES	CARBON	820 K	5%	1/4 W	OHMITE	RC07GF824J
R29	000153	RES	CARBON	15 K	5%	1/4 W1	OHMITE	RC07GF153J
R30	040050	RES	VARI	5 K	10%	1/2 W	BOURNS	3067-P-1-K0

PARTS LIST

ASSEMBLY 402442 - **PC Board Assembly, Filter, -** Model 5500-112/130

REF. DESIG.	PART NO.	DESCRIPTION							
C1	110043	CAP	ELECT	25 MFD	25 V	20%		DUCATI	25-25
C2	110043	CAP	ELECT	25 MFD	25 V	20%		DUCATI	25-25
C4	120116	CAP	POLYS	.056 MFD	200V	10%		ELPAC	PD2X536J
C5	120124	CAP	POLYS	.056 MFD	50V	10%		ELPAC	PD5X536J
C6	101182	CAP	CERAM	47 PFD	500 V	10%1		AEROVOX	TCD-N750
C7	120125	CAP	POLYS	.027 MFD	200V	10%		ELPAC	PD2X273J
C8	121146	CAP	MYLAR	.0047 MFD	100 V	10%1		CDE	WMF1D47
CR1	211083	DIODE	SILICO	018		1		DANA	211083
CR2	211083	DIODE	SILICO	018		1		DANA	211083
CR3	220004	DIODE	SILICO ZENER	1N961B		1		MOTOROLA	1N961B
CR4	211083	DIODE	SILICO	018				DANA	211083
CR5	211083	DIODE	SILICO	018		1		DANA	211083
CR6	211083	DIODE	SILICO	018		1		DANA	211083
CR7	211083	DIODE	SILICO	018		1		DANA	211083
K1	310013	RELAY	REED	SPST	24V	1		WHEELOCK	2961A X6
K2	310030	RELAY	DC	4 PDT	28V	1		PARELCO	INR10-E046
K3	310029	RELAY					AM	ZETTLR	AZ420-56
K4	310029	RELAY					AM	ZETTLR	AZ420-56
K5	310029	RELAY					AM	ZETTLR	AZ420-56
Q1	200022	TRANS	SILICO PNP	012				DANA	200022
Q2	200043	TRANS	SILICO NPN	2N3565				FAIRCHILD	2N3565
Q3	200043	TRANS	SILICO NPN	2N3565				FAIRCHILD	2N3565
Q4	200043	TRANS	SILICO NPN	2N3565				FAIRCHILD	2N3565
Q5	200043	TRANS	SILICO NPN	2N3565				FAIRCHILD	2N3565
R1	000101	RES	CARBON	100 OHM	5%	1/4 W1		OHMITE	RC07GF10J
R3	000362	RES	CARBON	3.6 K	5%	1/4 W1		OHMITE	RC07GF362J
R4	000102	RES	CARBON	1 K	5%	1/4 W1		OHMITE	RC07GF102J
R5	010333	RES	METAL	464 K	1%	1/4 W		ELECTRA	RN60D4643F
R6	000514	RES	CARBON	510 K	5%	1/4 W1		OHMITE	RC07GF524J
R7	000205	RES	CARBON	2 M	5%	1/4 W1		OHMITE	RC07GF205J
R8	000912	RES	CARBON	9.1 K	5%	1/4 W1		OHMITE	RC07GF912J
R9	010333	RES	METAL	464 K	1%	1/4 W		ELECTRA	RN60D4643F
R10	010333	RES	METAL	464 K	1%	1/4 W		ELECTRA	RN60D4643F
R11	010208	RES	METAL	182 K	1%	1/4 W1		ELECTRA	RN60D1823F
R12	010329	RES	METAL	887 K	1%	1/4 W		ELECTRA	RRN60D8873F

PARTS LIST

ASSEMBLY 402444 - **PC Board Assembly, Function Control** - Model 5500-112/130

REF. DESIG.	PART NO.	DESCRIPTION							
C1	110044	CAP	ELECT	50 MFD	50 V	20%		DUCATI	50-50
CR14	211083	DIODE	SILICO	018			1	DANA	211083
CR15	211083	DIODE	SILICO	018			1	DANA	211083
CR16	211083	DIODE	SILICO	018			1	DANA	211083
CR17	211083	DIODE	SILICO	018			1	DANA	211083
CR18	211083	DIODE	SILICO	018			1	DANA	211083
CR19	211083	DIODE	SILICO	018			1	DANA	211083
CR20	211083	DIODE	SILICO	018			1	DANA	211083
CR21	211083	DIODE	SILICO	018			1	DANA	211083
CR22	211083	DIODE	SILICO	018			1	DANA	211083
CR23	211083	DIODE	SILICO	018			1	DANA	211083
CR24	211083	DIODE	SILICO	018			1	DANA	211083
CR25	211083	DIODE	SILICO	018			1	DANA	211083
DS1	920116	LAMP	NEON	NE-2H				G E	MPG250-3
DS2	920116	LAMP	NEON	NE-2H				G E	MPG250-3
DS3	920116	LAMP	NEON	NE-2H				G E	MPG250-3
DS4	920116	LAMP	NEON	NE-2H				G E	MPG250-3
Q1	200035	TRANS	SILICO NPN	014				DANA	200035
Q2	200035	TRANS	SILICO NPN	014				DANA	200035
Q3	200079	TRANS		021				DANA	200079
Q4	200079	TRANS		021				DANA	200079
R1	000473	RES	CARBON	47 K		5%	1/4 W1	OHMITE	RC07GF473J
R2	000473	RES	CARBON	47 K		5%	1/4 W1	OHMITE	RC07GF473J
R3	000473	RES	CARBON	47 K		5%	1/4 W1	OHMITE	RC07GF473J
R4	000473	RES	CARBON	47 K		5%	1/4 W1	OHMITE	RC07GF473J
R5	000151	RES	CARBON	150 OHM		5%	1/4 W1	OHMITE	RC07GF151J
R8	000243	RES	CARBON	24 K		5%	1/4 W1	OHMITE	RC07GF243J
R9	040089	RES	VARI	200 K				BOURNS	30525-1-204M
R10	000914	RES	CARBON	910 K		5%	1/4 W	OHMITE	RC07GF914J
R11	000914	RES	CARBON	910 K		5%	1/4 W	OHMITE	RC07GF914J
R12	000914	RES	CARBON	910 K		5%	1/4 W	OHMITE	RC07GF914J
R13	000914	RES	CARBON	910 K		5%	1/4 W	OHMITE	RC07GF914J

PARTS LIST

ASSEMBLY 402957 - Model 5500-112/130 A

REF. DESIG.	PART NO.	DESCRIPTION								
C01	110044	CAP	ELECT	50 MFD	50 V	20%		DUCATI	50-50
CR14	211083	DIODE	SILICO	018			1	DANA	211083
CR15	211083	DIODE	SILICO	018			1	DANA	211083
CR16	211083	DIODE	SILICO	018			1	DANA	211083
CR17	211083	DIODE	SILICO	018			1	DANA	211083
CR18	211083	DIODE	SILICO	018			1	DANA	211083
CR19	211083	DIODE	SILICO	018			1	DANA	211083
CR20	211083	DIODE	SILICO	018			1	DANA	211083
CR21	211083	DIODE	SILICO	018			1	DANA	211083
CR22	211083	DIODE	SILICO	018			1	DANA	211083
CR23	211083	DIODE	SILICO	018			1	DANA	211083
CR24	211083	DIODE	SILICO	018			1	DANA	211083
CR25	211083	DIODE	SILICO	018			1	DANA	211083
DS01	920116	LAMP	NEON	NE-2H				G E	MPG250-3
DS02	920116	LAMP	NEON	NE-2H				G E	MPG250-3
DS03	920116	LAMP	NEON	NE-2H				G E	MPG250-3
DS04	920116	LAMP	NEON	NE-2H				G E	MPG250-3
Q01	200035	TRANS	SILICO NPN	014				DANA	200035
Q02	200035	TRANS	SILICO NPN	014				DANA	200035
Q03	200079	TRANS		021				DANA	200079
Q04	200079	TRANS		021				DANA	200079
R01	000473	RES	CARBON	47 K	5%	1/4 W1		OHMITE	RC07GF473J
R02	000473	RES	CARBON	47 K	5%	1/4 W1		OHMITE	RC07GF473J
R03	000473	RES	CARBON	47 K	5%	1/4 W1		OHMITE	RC07GF473J
R04	000473	RES	CARBON	47 K	5%	1/4 W1		OHMITE	RC07GF473J
R05	000151	RES	CARBON	150 OHM	5%	1/4 W1		OHMITE	RC07GF151J
R08	000243	RES	CARBON	24 K	5%	1/4 W1		OHMITE	RC07GF243J
R09	040089	RES	VARI	200 K				BOURNS	30525-1-204M
R10	000914	RES	CARBON	910 K	5%	1/4 W		OHMITE	RC07GF914J
R11	000914	RES	CARBON	910 K	5%	1/4 W		OHMITE	RC07GF914J
R12	000914	RES	CARBON	910 K	5%	1/4 W		OHMITE	RC07GF914J
R13	000914	RES	CARBON	910 K	5%	1/4 W		OHMITE	RC07GF914J
CR01	211083	DIODE	SILICO	018			1	DANA	211083
CR02	211083	DIODE	SILICO	018			1	DANA	211083

PARTS LIST

ASSEMBLY 402477 - Model 5500-112/130

REF. DESIG.	PART NO.	DESCRIPTION						
CR01	200048	TRANS SILICO NPN DUAL 2N3565					DANA	200048
CR2	211236	DIODE SILICO 007					DANA	211236
CR03	200048	TRANS SILICO NPN DUAL 2N3565					DANA	200048
CR4	211236	DIODE SILICO 007					DANA	211236
CR5	211083	DIODE SILICO 018				1	DANA	211083
CR6	211083	DIODE SILICO 018				1	DANA	211083
CR7	211083	DIODE SILICO 018				1	DANA	211083
CR8	211083	DIODE SILICO 018				1	DANA	211083
CR9	220012	DIODE SILICO ZENER 1N958B				1	MOTOROLA	1N958B
CR10	220012	DIODE SILICO ZENER 1N958B				1	MOTOROLA	1N958B
CR11	211083	DIODE SILICO 018				1	DANA	211083
CR12	211083	DIODE SILICO 018				1	DANA	211083
CR13	211083	DIODE SILICO 018				1	DANA	211083
CR14	211083	DIODE SILICO 018				1	DANA	211083
CR15	211083	DIODE SILICO 018				1	DANA	211083
CR16	210004	DIODE SILICO SD4					DIODES IN SD4	
CR17	210004	DIODE SILICO SD4					DIODES IN SD4	
CR18	221177	DIODE SILICO ZENER				1/4 W1	MOTOROLA	M.2.4A25
CR19	200048	TRANS SILICO NPN DUAL 2N3565					DANA	200048
CR20	200048	TRANS SILICO NPN DUAL 2N3565					DANA	200048
C01	120128	CAP	POLYS	.0056 MFD	125V	5%	OIEL	N100
C02	120092	CAP	MYLAR	1 MFD	300V		IMB	ZA2D105K
C3	120063	CAP	MYLAR	2 MFD	100 V	5%1	IMB	XT2B205J
C4	121146	CAP	MYLAR	.0047 MFD	100 V	10%1	CDE	WMF1D47
C5	120005	CAP	MYLAR	.001 MFD	100 V	10%1		WMF1D1
C6	110038	CAP	ELECT	50 MFD	15 V	20%	DUCATI	50-15
C7	110038	CAP	ELECT	50 MFD	15 V	20%	DUCATI	50-15
C8	110039	CAP	ELECT	5 MFD	50 V	20%	DUCATI	5-50
C9	120003	CAP	MYLAR	.1 MFD	100 V	10%1	CDE	WMF1P1
C10	110036	CAP	ELECT	25 MFD	50 V	20%	DUCATI	25-50
C11	110036	CAP	ELECT	25 MFD	50 V	20%	DUCATI	25-50
C12	100013	CAP	CERAM	15 PFD	500 V	10%	AEROVOX	TCD-N750
C13	101145	CAP	CERAM	100 PFD	500 V	10%1	AEROVOX	SCD1X5F
C14	120003	CAP	MYLAR	.1 MFD	100 V	10%1	CDE	WMF1P1
C15	121088	CAP	MYLAR	.01 MFD	100 V	10%	CDE	WMF1S1
C16	101145	CAP	CERAM	100 PFD	500 V	10%1	AEROVOX	SCD1X5F
Q1	201084	TRANS GERMAN PNP		2N1304		1	TI	2N1304
Q2	200027	TRANS SILICO		FSV			DANA	200027
Q3	200126	TRANS SILICO		DUAL FSV			DANA	200126

PARTS LIST

ASSEMBLY 402477 - Model 5500-112/130

REF. DESIG.	PART NO.	DESCRIPTION								
Q4	200126	TRANS SILICO	DUAL FSV						DANA	200126
Q5	200063	TRANS SILICO NPN	016						DANA	200063
Q6	200063	TRANS SILICO NPN	016						DANA	200063
Q7	200043	TRANS SILICO NPN	2N3565						FAIRCHILD	2N3565
Q8	200129	TRANS							FAIRCHILD	SE4020
Q9	200035	TRANS SILICO NPN	014						DANA	200035
Q10	200022	TRANS SILICO PNP	012						DANA	200022
Q11	200052	TRANS SILICO PNP	009						DANA	200052
Q12	200043	TRANS SILICO NPN	2N3565						FAIRCHILD	2N3565
Q13	200043	TRANS SILICO NPN	2N3565						FAIRCHILD	2N3565
Q14	200022	TRANS SILICO PNP	012						DANA	200022
Q15	200035	TRANS SILICO NPN	014						DANA	200035
Q16	200035	TRANS SILICO NPN	014						DANA	200035
R1	000152	RES	CARBON	1.5	K	5%	1/4	W1	OHMITE	RC07GF152J
R2	000101	RES	CARBON	100	OHM	5%	1/4	W1	OHMITE	RC07GF101J
R3	010249	RES	WW	25	M	2%	1/8	W	DALE	DC-2
R4	000101	RES	CARBON	100	OHM	5%	1/4	W1	OHMITE	RC07GF101J
R5	000622	RES	CARBON	6.2	K	5%	1/4	W1	OHMITE	RC07GF622J
R6	000242	RES	CARBON	2.4	K	5%	1/4	W1	OHMITE	RC07GF242J
R7	040005	RES	VARI	10	K	10%	1/2	W	BOURNS	3067-P-1-10
R8	000152	RES	CARBON	1.5	K	5%	1/4	W1	OHMITE	RC07GF152J
R10	000752	RES	CARBON	7.5	K	5%	1/4	W1	OHMITE	RC07GF752J
R11	000136	RES	CARBON	13	M	5%	1/4	W	OHMITE	RC07GF136J
R12	001734	RES	FSV						DANA	001734
R13	010236	RES	WW	10	MEG	1%	1	W1	PME	PME70T2
R15	000685	RES	CARBON	6.8	M	5%	1/4	W	OHMITE	RC07GF685J
R16	000132	RES	CARBON	1.3	K	5%	1/4	W	OHMITE	RC07GF132J
R18	010236	RES	WW	10	MEG	1%	1	W1	PME	PME70T2
R20	000335	RES	CARBON	3.3	M	5%	1/4	W1	OHMITE	RC07GF335J
R21	000565	RES	CARBON	5.6	M	5%	1/4	W1	OHMITE	RC07GF565J
R22	000393	RES	CARBON	39	K	5%	1/4	W	OHMITE	RC07GF393J
R23	000912	RES	CARBON	9.1	K	5%	1/4	W1	OHMITE	RC07GF912J
R24	000513	RES	CARBON	51	K	5%	1/4	W1	OHMITE	RC07GF513J
R25	000102	RES	CARBON	1	K	5%	1/4	W1	OHMITE	RC07GF102J
R26	000122	RES	CARBON	1.2	K	5%	1/4	W1	OHMITE	RC07GF122J
R27	000102	RES	CARBON	1	K	5%	1/4	W1	OHMITE	RC07GF102J
R28	000472	RES	CARBON	4.7	K	5%	1/4	W1	OHMITE	RC07GF472J
R29	000101	RES	CARBON	100	OHM	5%	1/4	W1	OHMITE	RC07GF101J

PARTS LIST

ASSEMBLY 402477 - Model 5500-112/130

REF. DESIG.	PART NO.	DESCRIPTION							
R30	000912	RES	CARBON	9.1 K	5%	1/4 W1	OHMITE	RC07GF912J
R31	000102	RES	CARBON	1 K	5%	1/4 W1	OHMITE	RC07GF102J
R32	000912	RES	CARBON	9.1 K	5%	1/4 W1	OHMITE	RC07GF912J
R33	000332	RES	CARBON	3.3 K	5%	1/4 W1	OHMITE	RC07GF332J
R34	000332	RES	CARBON	3.3 K	5%	1/4 W1	OHMITE	RC07GF332J
R35	000511	RES	CARBON	510 OHM	5%	1/4 W1	OHMITE	RC07GF511J
R36	000153	RES	CARBON	15 K	5%	1/4 W1	OHMITE	RC07GF153J
R37	000240	RES	CARBON	24 OHM	5%	1/4 W1	OHMITE	RC07GF240J
R38	000750	RES	CARBON	75 OHM	5%	1/4 W1	OHMITE	RC07GF750J
R39	000240	RES	CARBON	24 OHM	5%	1/4 W1	OHMITE	RC07GF240J
R40	000433	RES	CARBON	43 K	5%	1/4 W	OHMITE	RC07GF433J
R41	000101	RES	CARBON	100 OHM	5%	1/4 W1	OHMITE	RC07GF101J
R42	000153	RES	CARBON	15 K	5%	1/4 W1	OHMITE	RC07GF153J
R43	000103	RES	CARBON	10 K	5%	1/4 W1	OHMITE	RC07GF103J
R44	001734	RES	FSV				DANA	001734
R49	000750	RES	CARBON	75 OHM	5%	1/4 W1	OHMITE	RC07GF750J

PARTS LIST

ASSEMBLY 402667 - **PC Board Assembly, Range Control** - Model 5500-112/130

REF. DESIG.	PART NO.	DESCRIPTION							
C1	101174	CAP	CERAM	.001 MFD	500 V	10%1		AEROVOX	SCD3X5F
F-C1	121092	CAP	MYLAR	.0022 MFD	100 V	10%		CDE	WMF1D22
C2	121093	CAP	MYLAR	.047 MFD	100 V	10%1		CDE	WMF1S47
CR1	211083	DIODE	SILICO	018		1		DANA	211083
A-CR1	210004	DIODE	SILICO	SD4				DIODES IN SD4	
CR2	211083	DIODE	SILICO	018		1		DANA	211083
A-CR2	210004	DIODE	SILICO	SD4				DIODES IN SD4	
J-CR2	210004	DIODE	SILICO	SD4				DIODES IN SD4	
CR2K	210004	DIODE	SILICO	SD4				DIODES IN SD4	
M-CR2	210004	DIODE	SILICO	SD4				DIODES IN SD4	
CR3	211083	DIODE	SILICO	018		1		DANA	211083
A-CR3	210004	DIODE	SILICO	SD4				DIODES IN SD4	
L-CR3	210004	DIODE	SILICO	SD4				DIODES IN SD4	
U-CR3	210004	DIODE	SILICO	SD4				DIODES IN SD4	
CR4	211083	DIODE	SILICO	018		1		DANA	211083
A-CR4	210004	DIODE	SILICO	SD4				DIODES IN SD4	
CR5	210004	DIODE	SILICO	SD4				DIODES IN SD4	
CR25	211083	DIODE	SILICO	018		1		DANA	211083
CR26	211083	DIODE	SILICO	018		1		DANA	211083
CR27	211083	DIODE	SILICO	018		1		DANA	211083
CR28	211083	DIODE	SILICO	018		1		DANA	211083
CR36	211083	DIODE	SILICO	018		1		DANA	211083
CR37	210004	DIODE	SILICO	SD4				DIODES IN SD4	
CR38	210004	DIODE	SILICO	SD4				DIODES IN SD4	
CR39	211083	DIODE	SILICO	018		1		DANA	211083
CR42	211083	DIODE	SILICO	018		1		DANA	211083
CR43	220004	DIODE	SILICO	ZENER	1N961B	1		MOTOROLA	1N961B
Q1	200043	TRANS	SILICO	NPN	2N3565			FAIRCHILD	2N3565
Q2	200043	TRANS	SILICO	NPN	2N3565			FAIRCHILD	2N3565
Q3	200043	TRANS	SILICO	NPN	2N3565			FAIRCHILD	2N3565
Q4	200079	TRANS		021				DANA	200079
Q5	200043	TRANS	SILICO	NPN	2N3565			FAIRCHILD	2N3565
Q6	200037	TRANS	SILICO	NPN	2N3646			FAIRCHILD	2N3646
R1	000222	RES	CARBON	2.2 K	5%	1/4 W1		OHMITE	RC07GF222J
R2	000153	RES	CARBON	15 K	5%	1/4 W1		OHMITE	RC07GF153J
R3	000222	RES	CARBON	2.2 K	5%	1/4 W1		OHMITE	RC07GF222J
R4	000153	RES	CARBON	15 K	5%	1/4 W1		OHMITE	RC07GF153J
R5	000822	RES	CARBON	8.2 K	5%	1/4 W1		OHMITE	RC07GF822J

PARTS LIST

ASSEMBLY 402667 - **PC Board Assembly, Range Control** - Model 5500-112/130

REF. DESIG.	PART NO.	DESCRIPTION						
R6	000153	RES	CARBON	15 K	5%	1/4 W1	OHMITE	RC07GF153J
R7	000204	RES	CARBON	200 K	5%	1/4 W	OHMITE	RC07GF204J
R8	000243	RES	CARBON	24 K	5%	1/4 W1	OHMITE	RC07GF243J
H-R8	000123	RES	CARBON	12 K	5%	1/4 W1	OHMITE	RC07GF123J
C-R8	000123	RES	CARBON	12 K	5%	1/4 W1	OHMITE	RC07GF123J
D-R8	000512	RES	CARBON	5.1 K	5%	1/4 W1	OHMITE	RC07GF512J
E-R8	000512	RES	CARBON	5.1 K	5%	1/4 W1	OHMITE	RC07GF512J
H-R8	000822	RES	CARBON	8.2 K	5%	1/4 W1	OHMITE	RC07GF822J
J-R8	000822	RES	CARBON	8.2 K	5%	1/4 W1	OHMITE	RC07GF822J
K-R8	000822	RES	CARBON	8.2 K	5%	1/4 W1	OHMITE	RC07GF822J
L-R8	000822	RES	CARBON	8.2 K	5%	1/4 W1	OHMITE	RC07GF822J
M-R8	000822	RES	CARBON	8.2 K	5%	1/4 W1	OHMITE	RC07GF822J
T-R8	000682	RES	CARBON	6.8 K	5%	1/4 W1	OHMITE	RC07GF682J
V-R8	000822	RES	CARBON	8.2 K	5%	1/4 W1	OHMITE	RC07GF822J
R10	000273	RES	CARBON	27 K	5%	1/4 W1	OHMITE	RC07GF273J
R11	000243	RES	CARBON	24 K	5%	1/4 W1	OHMITE	RC07GF243J
R12	000822	RES	CARBON	8.2 K	5%	1/4 W1	OHMITE	RC07GF822J
R13	000202	RES	CARBON	2K	5%	1/4 W1	OHMITE	RC07GF202J
R18	030013	RES	CARBON	200K	5%	1 W	OHMITE	RC32GF204J
R19	000104	RES	CARBON	100 K	5%	1/4 W1	OHMITE	RC07GF104J
R20	000104	RES	CARBON	100 K	5%	1/4 W1	OHMITE	RC07GF104J
R21	000512	RES	CARBON	5.1 K	5%	1/4 W1	OHMITE	RC07GF512J
R22	000512	RES	CARBON	5.1 K	5%	1/4 W1	OHMITE	RC07GF512J
R23	030013	RES	CARBON	200K	5%	1 W	OHMITE	RC32GF204J
R24	030012	RES	CARBON	130 K	5%	1 W	OHMITE	RC32GF134J

PARTS LIST

ASSEMBLY 403114 RANGE CONTROL - Model 5500-112/130 A

REF. DESIG.	PART NO.	DESCRIPTION		
A-CR01	210004	DIODE SILICO	SD4	DIODES IN SD4
P-CR01	210004	DIODE SILICO	SD4	DIODES IN SD4
J-CR01	211083	DIODE SILICO	018	DANA 211083
B-CR01	211083	DIODE SILICO	018	DANA 211083
K-CR01	211083	DIODE SILICO	018	DANA 211083
L-CR01	210004	DIODE SILICO	SD4	DIODES IN SD4
S-CR01	211083	DIODE SILICO	018	DANA 211083
C-CR01	211083	DIODE SILICO	018	DANA 211083
T-CR01	211083	DIODE SILICO	018	DANA 211083
D-CR01	211083	DIODE SILICO	018	DANA 211083
M-CR01	211083	DIODE SILICO	018	DANA 211083
U-CR01	211083	DIODE SILICO	018	DANA 211083
E-CR01	211083	DIODE SILICO	018	DANA 211083
N-CR01	211083	DIODE SILICO	018	DANA 211083
V-CR01	211083	DIODE SILICO	018	DANA 211083
F-CR01	211083	DIODE SILICO	018	DANA 211083
H-CR01	211083	DIODE SILICO	018	DANA 211083
R-CR01	211083	DIODE SILICO	018	DANA 211083
A-CR02	210004	DIODE SILICO	SD4	DIODES IN SD4
B-CR02	210004	DIODE SILICO	SD4	DIODES IN SD4
K-CR02	210004	DIODE SILICO	SD4	DIODES IN SD4
P-CR02	210004	DIODE SILICO	SD4	DIODES IN SD4
L-CR02	210014	DIODE SILICO	023	DANA 210014
J-CR02	211083	DIODE SILICO	018	DANA 211083
S-CR02	211083	DIODE SILICO	018	DANA 211083
C-CR02	211083	DIODE SILICO	018	DANA 211083
T-CR02	211083	DIODE SILICO	018	DANA 211083
D-CR02	211083	DIODE SILICO	018	DANA 211083
M-CR02	211083	DIODE SILICO	018	DANA 211083
U-CR02	211083	DIODE SILICO	018	DANA 211083
E-CR02	211083	DIODE SILICO	018	DANA 211083
N-CR02	211083	DIODE SILICO	018	DANA 211083
V-CR02	211083	DIODE SILICO	018	DANA 211083
F-CR02	211083	DIODE SILICO	018	DANA 211083
H-CR02	211083	DIODE SILICO	018	DANA 211083
R-CR02	211083	DIODE SILICO	018	DANA 211083
A-CR03	210004	DIODE SILICO	SD4	DIODES IN SD4
B-CR03	210004	DIODE SILICO	SD4	DIODES IN SD4
K-CR03	210004	DIODE SILICO	SD4	DIODES IN SD4

PARTS LIST

ASSEMBLY 403114 RANGE CONTROL - Model 5500-112/130 A

REF. DESIG.	PART NO.	DESCRIPTION		
L-CR03	210004	DIODE SILICO	SD4	DIODES IN SD4
P-CR03	210004	DIODE SILICO	SD4	DIODES IN SD4
M-CR03	210014	DIODE SILICO	023	DANA 210014
J-CR03	211083	DIODE SILICO	018	DANA 211083
E-CR03	211083	DIODE SILICO	018	DANA 211083
N-CR03	211083	DIODE SILICO	018	DANA 211083
V-CR03	211083	DIODE SILICO	018	DANA 211083
F-CR03	211083	DIODE SILICO	018	DANA 211083
H-CR03	211083	DIODE SILICO	018	DANA 211083
R-CR03	211083	DIODE SILICO	018	DANA 211083
A-CR04	210004	DIODE SILICO	SD4	DIODES IN SD4
R-CR04	210004	DIODE SILICO	SD4	DIODES IN SD4
B-CR04	211083	DIODE SILICO	018	DANA 211083
K-CR04	211083	DIODE SILICO	018	DANA 211083
L-CR04	211083	DIODE SILICO	018	DANA 211083
A-CR05	210004	DIODE SILICO	SD4	DIODES IN SD4
R-CR05	210004	DIODE SILICO	SD4	DIODES IN SD4
B-CR05	211083	DIODE SILICO	018	DANA 211083
B-CR06	211083	DIODE SILICO	018	DANA 211083
A-CR25	211083	DIODE SILICO	018	DANA 211083
J-CR25	211083	DIODE SILICO	018	DANA 211083
B-CR25	211083	DIODE SILICO	018	DANA 211083
K-CR25	211083	DIODE SILICO	018	DANA 211083
C-CR25	211083	DIODE SILICO	018	DANA 211083
L-CR25	211083	DIODE SILICO	018	DANA 211083
D-CR25	211083	DIODE SILICO	018	DANA 211083
M-CR25	211083	DIODE SILICO	018	DANA 211083
E-CR25	211083	DIODE SILICO	018	DANA 211083
N-CR25	211083	DIODE SILICO	018	DANA 211083
F-CR25	211083	DIODE SILICO	018	DANA 211083
G-CR25	211083	DIODE SILICO	018	DANA 211083
H-CR25	211083	DIODE SILICO	018	DANA 211083
I-CR25	211083	DIODE SILICO	018	DANA 211083
A-CR26	211083	DIODE SILICO	018	DANA 211083
B-CR26	211083	DIODE SILICO	018	DANA 211083
A-CR27	211083	DIODE SILICO	018	DANA 211083
B-CR27	211083	DIODE SILICO	018	DANA 211083

PARTS LIST

ASSEMBLY 403114 RANGE CONTROL - Model 5500-112/130 A

REF. DESIG.	PART NO.	DESCRIPTION						
A-CR28	211083	DIODE	SILICO		018		DANA	211083
CR37	210004	DIODE	SILICO		SD4		DIODES IN	SD4
CR38	210004	DIODE	SILICO		SD4		DIODES IN	SD4
CR39	210004	DIODE	SILICO		SD4		DIODES IN	SD4
CR40	210004	DIODE	SILICO		SD4		DIODES IN	SD4
A-CR41	211083	DIODE	SILICO		018		DANA	211083
A-CR42	220034	DIODE	SILICO		1N9608		MOTOROLA	1N9608
C01	101174	CAP	CERAM	.001 MFD 500 V		10%	AEROVOX	SCD3X5F
E-C01	121092	CAP	MYLAR	.0022 MFD 100 V		10%	CDE	WMF1D22
A-C03	110053	CAP	TANTA	.68 MFD 35 V		10%	KEMET	KR68R35K
C04	101174	CAP	CERAM	.001 MFD 500 V		10%	AEROVOX	SCD3X5F
C05	101174	CAP	CERAM	.001 MFD 500 V		10%	AEROVOX	SCD3X5F
C-Q03	200037	TRANS	SILICO	NPN	2N3646		FAIRCHILD	2N3646
A-Q03	200043	TRANS	SILICO	NPN	2N3565		FAIRCHILD	2N3565
B-Q03	200043	TRANS	SILICO	NPN	2N3565		FAIRCHILD	2N3565
A-Q04	200079	TRANS			021		DANA	200079
B-Q04	200079	TRANS			021		DANA	200079
C-Q04	200079	TRANS			021		DANA	200079
D-Q04	200079	TRANS			021		DANA	200079
E-Q04	200079	TRANS			021		DANA	200079
A-Q07	200043	TRANS	SILICO	NPN	2N3565		FAIRCHILD	2N3565
B-Q07	200043	TRANS	SILICO	NPN	2N3565		FAIRCHILD	2N3565
C-Q07	200043	TRANS	SILICO	NPN	2N3565		FAIRCHILD	2N3565
A-Q08	200043	TRANS	SILICO	NPN	2N3565		FAIRCHILD	2N3565
B-Q08	200043	TRANS	SILICO	NPN	2N3565		FAIRCHILD	2N3565
C-Q08	200043	TRANS	SILICO	NPN	2N3565		FAIRCHILD	2N3565
A-Q09	200043	TRANS	SILICO	NPN	2N3565		FAIRCHILD	2N3565
A-Q10	200037	TRANS	SILICO	NPN	2N3646		FAIRCHILD	2N3646
A-Q11	200043	TRANS	SILICO	NPN	2N3565		FAIRCHILD	2N3565
A-Q12	200043	TRANS	SILICO	NPN	2N3565		FAIRCHILD	2N3565
A-R05	000822	RES	CARBON	8.2 K	5%	1/4 W	OHMITE	RC07GF822J
B-R05	000822	RES	CARBON	8.2 K	5%	1/4 W	OHMITE	RC07GF822J
C-R05	000822	RES	CARBON	8.2 K	5%	1/4 W	OHMITE	RC07GF822J
A-R06	000153	RES	CARBON	15 K	5%	1/4 W	OHMITE	RC07GF153J
B-R06	000153	RES	CARBON	15 K	5%	1/4 W	OHMITE	RC07GF153J
C-R06	000153	RES	CARBON	15 K	5%	1/4 W	OHMITE	RC07GF153J
A-R07	000204	RES	CARBON	200 K	5%	1/4 W	OHMITE	RC07GF204J
B-R07	000204	RES	CARBON	200 K	5%	1/4 W	OHMITE	RC07GF204J
C-R07	000204	RES	CARBON	200 K	5%	1/4 W	OHMITE	RC07GF204J

PARTS LIST

ASSEMBLY 403114 RANGE CONTROL - Model 5500-112/130 A

REF. DESIG.	PART NO.	DESCRIPTION						
C-R08	C00123	RES	CARBON	12 K	5%	1/4 W	OHMITE	RC07GF123J
C-R08	000123	RES	CARBON	12 K	5%	1/4 W	OHMITE	RC07GF123J
A-R08	000243	RES	CARBON	24 K	5%	1/4 W	OHMITE	RC07GF243J
B-R08	000243	RES	CARBON	24 K	5%	1/4 W	OHMITE	RC07GF243J
S-R08	000243	RES	CARBON	24 K	5%	1/4 W	OHMITE	RC07GF243J
T-R08	C00243	RES	CARBON	24 K	5%	1/4 W	OHMITE	RC07GF243J
U-R08	000243	RES	CARBON	24 K	5%	1/4 W	OHMITE	RC07GF243J
H-R08	000243	RES	CARBON	24 K	5%	1/4 W	OHMITE	RC07GF243J
R-R08	000243	RES	CARBON	24 K	5%	1/4 W	OHMITE	RC07GF243J
E-R08	000512	RES	CARBON	5.1 K	5%	1/4 W	OHMITE	RC07GF512J
F-R08	C00512	RES	CARBON	5.1 K	5%	1/4 W	OHMITE	RC07GF512J
V-R08	000682	RES	CARBON	6.8 K	5%	1/4 W	OHMITE	RC07GF682J
J-R08	000822	RES	CARBON	8.2 K	5%	1/4 W	OHMITE	RC07GF822J
K-R08	000822	RES	CARBON	8.2 K	5%	1/4 W	OHMITE	RC07GF822J
L-R08	000822	RES	CARBON	8.2 K	5%	1/4 W	OHMITE	RC07GF822J
M-R08	000822	RES	CARBON	8.2 K	5%	1/4 W	OHMITE	RC07GF822J
N-R08	000822	RES	CARBON	8.2 K	5%	1/4 W	OHMITE	RC07GF822J
P-R08	000822	RES	CARBON	8.2 K	5%	1/4 W	OHMITE	RC07GF822J
A-R10	000273	RES	CARBON	27 K	5%	1/4 W	OHMITE	RC07GF273J
J-R10	000273	RES	CARBON	27 K	5%	1/4 W	OHMITE	RC07GF273J
B-R10	C00273	RES	CARBON	27 K	5%	1/4 W	OHMITE	RC07GF273J
K-R10	000273	RES	CARBON	27 K	5%	1/4 W	OHMITE	RC07GF273J
C-R10	000273	RES	CARBON	27 K	5%	1/4 W	OHMITE	RC07GF273J
L-R10	000273	RES	CARBON	27 K	5%	1/4 W	OHMITE	RC07GF273J
D-R10	000273	RES	CARBON	27 K	5%	1/4 W	OHMITE	RC07GF273J
M-R10	000273	RES	CARBON	27 K	5%	1/4 W	OHMITE	RC07GF273J
E-R10	000273	RES	CARBON	27 K	5%	1/4 W	OHMITE	RC07GF273J
N-R10	000273	RES	CARBON	27 K	5%	1/4 W	OHMITE	RC07GF273J
F-R10	000273	RES	CARBON	27 K	5%	1/4 W	OHMITE	RC07GF273J
G-R10	000273	RES	CARBON	27 K	5%	1/4 W	OHMITE	RC07GF273J
H-R10	000273	RES	CARBON	27 K	5%	1/4 W	OHMITE	RC07GF273J
I-R10	000273	RES	CARBON	27 K	5%	1/4 W	OHMITE	RC07GF273J
A-R16	000222	RES	CARBON	2.2 K	5%	1/4 W	OHMITE	RC07GF222J
B-R16	000222	RES	CARBON	2.2 K	5%	1/4 W	OHMITE	RC07GF222J
C-R16	000222	RES	CARBON	2.2 K	5%	1/4 W	OHMITE	RC07GF222J
A-R17	000153	RES	CARBON	15 K	5%	1/4 W	OHMITE	RC07GF153J
B-R17	000153	RES	CARBON	15 K	5%	1/4 W	OHMITE	RC07GF153J
C-R17	000153	RES	CARBON	15 K	5%	1/4 W	OHMITE	RC07GF153J
A-R18	000512	RES	CARBON	5.1 K	5%	1/4 W	OHMITE	RC07GF512J

PARTS LIST

ASSEMBLY 403114 · RANGE CONTROL - Model 5500-112/130 A

REF. DESIG.	PART NO.	DESCRIPTION						
B-R18	000512	RES	CARBON	5.1 K	5%	1/4 W	OHMITE	RC07GF512J
C-R18	000512	RES	CARBON	5.1 K	5%	1/4 W	OHMITE	RC07GF512J
A-R19	000222	RES	CARBON	2.2 K	5%	1/4 W	OHMITE	RC07GF222J
B-R19	000222	RES	CARBON	2.2 K	5%	1/4 W	OHMITE	RC07GF222J
C-R19	000222	RES	CARBON	2.2 K	5%	1/4 W	OHMITE	RC07GF222J
A-R20	000153	RES	CARBON	15 K	5%	1/4 W	OHMITE	RC07GF153J
B-R20	000153	RES	CARBON	15 K	5%	1/4 W	OHMITE	RC07GF153J
C-R20	000153	RES	CARBON	15 K	5%	1/4 W	OHMITE	RC07GF153J
A-R21	000512	RES	CARBON	5.1 K	5%	1/4 W	OHMITE	RC07GF512J
B-R21	000512	RES	CARBON	5.1 K	5%	1/4 W	OHMITE	RC07GF512J
C-R21	000512	RES	CARBON	5.1 K	5%	1/4 W	OHMITE	RC07GF512J
A-R22	000153	RES	CARBON	15 K	5%	1/4 W	OHMITE	RC07GF153J
A-R23	000822	RES	CARBON	8.2 K	5%	1/4 W	OHMITE	RC07GF822J
A-R24	000104	RES	CARBON	100 K	5%	1/4 W	OHMITE	RC07GF104J
A-R26	000202	RES	CARBON	2 K	5%	1/4 W	OHMITE	RC07GF202J
R27	030012	RES	CARBON	130 K	5%	1 W	OHMITE	RC32GF134J
A-R28	000104	RES	CARBON	100 K	5%	1/4 W	OHMITE	RC07GF104J
R29	030013	RES	CARBON	200 K	5%	1 W	OHMITE	RC32GF204J
R30	030013	RES	CARBON	200 K	5%	1 W	OHMITE	RC32GF204J
R31	000102	RES	CARBON	1 K	5%	1/4 W	OHMITE	RC07GF102J
A-R32	000104	RES	CARBON	100 K	5%	1/4 W	OHMITE	RC07GF104J
A-R33	000104	RES	CARBON	100 K	5%	1/4 W	OHMITE	RC07GF104J
R34	000102	RES	CARBON	1 K	5%	1/4 W	OHMITE	RC07GF102J

PARTS LIST

ASSEMBLY 402440 - **PC Board Assembly, Range Control** - Model 5500-112/130

REF. DESIG.	PART NO.	DESCRIPTION							
C1	101174	CAP	CERAM	.001	MFD	500 V	10%1	AEROVOX	SCD3X5F
F-C1	121092	CAP	MYLAR	.0022	MFD	100 V	10%	CDE	WMF1D22
C3	121092	CAP	MYLAR	.0022	MFD	100 V	10%	CDE	WMF1D22
CR1	211083	DIODE	SILICO	018			1	DANA	211083
B-CR1	210004	DIODE	SILICO	SD4				DIODES IN SD4	
CR2	211083	DIODE	SILICO	018			1	DANA	211083
B-CR2	210004	DIODE	SILICO	SD4				DIODES IN SD4	
CR3	211083	DIODE	SILICO	018			1	DANA	211083
B-CR3	210004	DIODE	SILICO	SD4				DIODES IN SD4	
CR4	211083	DIODE	SILICO	018			1	DANA	211083
CR25	211083	DIODE	SILICO	018			1	DANA	211083
CR27	211083	DIODE	SILICO	018			1	DANA	211083
CR28	211083	DIODE	SILICO	018			1	DANA	211083
CR37	211083	DIODE	SILICO	018			1	DANA	211083
CR38	211083	DIODE	SILICO	018			1	DANA	211083
Q3	200043	TRANS	SILICO NPN	2N3565				FAIRCHILD	2N3565
Q4	200079	TRANS		021				DANA	200079
Q7	200043	TRANS	SILICO NPN	2N3565				FAIRCHILD	2N3565
Q8	200043	TRANS	SILICO NPN	2N3565				FAIRCHILD	2N3565
Q9	200043	TRANS	SILICO NPN	2N3565				FAIRCHILD	2N3565
Q10	200037	TRANS	SILICO NPN	2N3646				FAIRCHILD	2N3646
R5	000822	RES	CARBON	8.2	K	5%	1/4 W1	OHMITE	RC07GF822J
R6	000153	RES	CARBON	15	K	5%	1/4 W1	OHMITE	RC07GF153J
R7	000204	RES	CARBON	200	K	5%	1/4 W	OHMITE	RC07GF204J
R8	000243	RES	CARBON	24	K	5%	1/4 W1	OHMITE	RC07GF243J
C-R8	000822	RES	CARBON	8.2	K	5%	1/4 W1	OHMITE	RC07GF822J
F-R8	000512	RES	CARBON	5.1	K	5%	1/4 W1	OHMITE	RC07GF512J
H-R8	000512	RES	CARBON	5.1	K	5%	1/4 W1	OHMITE	RC07GF512J
J-R8	000822	RES	CARBON	8.2	K	5%	1/4 W1	OHMITE	RC07GF822J
R10	000273	RES	CARBON	27	K	5%	1/4 W1	OHMITE	RC07GF273J
R16	000222	RES	CARBON	2.2	K	5%	1/4 W1	OHMITE	RC07GF222J
R17	000153	RES	CARBON	15	K	5%	1/4 W1	OHMITE	RC07GF153J
R18	000512	RES	CARBON	5.1	K	5%	1/4 W1	OHMITE	RC07GF512J
R19	000222	RES	CARBON	2.2	K	5%	1/4 W1	OHMITE	RC07GF222J
R20	000153	RES	CARBON	15	K	5%	1/4 W1	OHMITE	RC07GF153J
R21	000512	RES	CARBON	5.1	K	5%	1/4 W1	OHMITE	RC07GF512J
R22	000243	RES	CARBON	24	K	5%	1/4 W1	OHMITE	RC07GF243J
R23	000822	RES	CARBON	8.2	K	5%	1/4 W1	OHMITE	RC07GF822J

PARTS LIST

ASSEMBLY 402440 - **PC Board Assembly, Range Control** - Model 5500-112/130

REF. DESIG.	PART NO.	DESCRIPTION						
R24	000104	RES	CARBON	100 K	5%	1/4 W1	OHMITE	RC07GF104J
R26	000822	RES	CARBON	8.2 K	5%	1/4 W1	OHMITE	RC07GF822J
R27	000153	RES	CARBON	15 K	5%	1/4 W1	OHMITE	RC07GF153J
R28	000512	RES	CARBON	5.1 K	5%	1/4 W1	OHMITE	RC07GF512J
R31	030013	RES	CARBON	200K	5%	1 W	OHMITE	RC32GF204J
R32	030013	RES	CARBON	200K	5%	1W	OHMITE	RC32GF204J
R33	030012	RES	CARBON	130 K	5%	1 W	OHMITE	RC32GF134J

PARTS LIST

ASSEMBLY 402696 - Model 5500-112/130

A

REF. DESIG.	PART NO.	DESCRIPTION							
C01	101174	CAP	CERAM	.001 MFD	500 V	10%1		AEROVOX	SCD3X5F
F-C01	121092	CAP	MYLAR	.0022 MFD	100 V	10%		CDE	WMF1D22
C03	121093	CAP	MYLAR	.047 MFD	100 V	10%1		CDE	WMF1S47
B-CR01	210004	DIODE	SILICO	SD4				DIODES IN SD4	
CR01	211083	DIODE	SILICO	018			I	DANA	211083
B-CR02	210004	DIODE	SILICO	SD4				DIODES IN SD4	
CR02	211083	DIODE	SILICO	018			1	DANA	211083
B-CR03	210004	DIODE	SILICO	SD4				DIODES IN SD4	
CR03	211083	DIODE	SILICO	018			1	DANA	211083
CR04	211083	DIODE	SILICO	018			1	DANA	211083
CR25	211083	DIODE	SILICO	018			1	DANA	211083
CR27	211083	DIODE	SILICO	018			1	DANA	211083
CR28	211083	DIODE	SILICO	018			1	DANA	211083
CR37	211083	DIODE	SILICO	018			1	DANA	211083
CR38	211083	DIODE	SILICO	018			1	DANA	211083
CR39	220004	DIODE	SILICO	ZENER	1N961B		I	MOTOROLA	1N961B
Q03	200043	TRANS	SILICO	NPN	2N3565			FAIRCHILD	2N3565
Q04	200079	TRANS		021				DANA	200079
Q07	200043	TRANS	SILICO	NPN	2N3565			FAIRCHILD	2N3565
Q08	200043	TRANS	SILICO	NPN	2N3565			FAIRCHILD	2N3565
Q09	200043	TRANS	SILICO	NPN	2N3565			FAIRCHILD	2N3565
Q10	200037	TRANS	SILICO	NPN	2N3646			FAIRCHILD	2N3646
R05	000822	RES	CARBON	8.2 K	5%	1/4 W1		OHMITE	RC07GF822J
R06	000153	RES	CARBON	15 K	5%	1/4 W1		OHMITE	RC07GF153J
R07	000204	RES	CARBON	200 K	5%	1/4 W		OHMITE	RC07GF204J
R08	000243	RES	CARBON	24 K	5%	1/4 W1		OHMITE	RC07GF243J
C-R08	000822	RES	CARBON	8.2 K	5%	1/4 W1		OHMITE	RC07GF822J
F-R08	000512	RES	CARBON	5.1 K	5%	1/4 W1		OHMITE	RC07GF512J
H-R08	000512	RES	CARBON	5.1 K	5%	1/4 W1		OHMITE	RC07GF512J
J-R08	000822	RES	CARBON	8.2 K	5%	1/4 W1		OHMITE	RC07GF822J
R10	000273	RES	CARBON	27 K	5%	1/4 W1		OHMITE	RC07GF273J
R16	000222	RES	CARBON	2.2 K	5%	1/4 W1		OHMITE	RC07GF222J
R17	000153	RES	CARBON	15 K	5%	1/4 W1		OHMITE	RC07GF153J
R18	000512	RES	CARBON	5.1 K	5%	1/4 W1		OHMITE	RC07GF512J
R19	000222	RES	CARBON	2.2 K	5%	1/4 W1		OHMITE	RC07GF222J
R20	000153	RES	CARBON	15 K	5%	1/4 W1		OHMITE	RC07GF153J
R21	000512	RES	CARBON	5.1 K	5%	1/4 W1		OHMITE	RC07GF512J
R22	000243	RES	CARBON	24 K	5%	1/4 W1		OHMITE	RC07GF243J

PARTS LIST

ASSEMBLY 402696 - Model 5500-112/130 A

REF. DESIG.	PART NO.	DESCRIPTION							
R23	000822	RES	CARBON	8.2 K	5%	1/4	W1	OHMITE	RC07GF822J
R24	000104	RES	CARBON	100 K	5%	1/4	W1	OHMITE	RC07GF104J
R26	000202	RES	CARBON	2 K	5%	1/4	W1	OHMITE	RC07GF202J
R28	000104	RES	CARBON	100 K	5%	1/4	W1	OHMITE	RC07GF104J
R31	030013	RES	CARBON	200 K	5%	1	W	OHMITE	RC32GF204J
R32	030013	RES	CARBON	200 K	5%	1	W	OHMITE	RC32GF204J
R33	030012	RES	CARBON	130 K	5%	1	W	OHMITE	RC32GF134J

PARTS LIST

ASSEMBLY 400706 PC Board Assy-AC Converter - Model 5500-112/130 A

REF. DESIG.	PART NO.	DESCRIPTION						
CR01	211083	DIODE SILICO	018		1	DANA	211083	
CR02	211083	DIODE SILICO	018		1	DANA	211083	
CR03	211083	DIODE SILICO	018		1	DANA	211083	
CR04	211083	DIODE SILICO	018		1	DANA	211083	
CR05	211083	DIODE SILICO	018		1	DANA	211083	
CR06	211083	DIODE SILICO	018		1	DANA	211083	
CR07	211083	DIODE SILICO	018		1	DANA	211083	
CR08	211083	DIODE SILICO	018		1	DANA	211083	
CR09	220004	DIODE SILICO ZENER	1N961B		1	MOTOROLA	1N961B	
CR10	211083	DIODE SILICO	018		1	DANA	211083	
CR11	211083	DIODE SILICO	018		1	DANA	211083	
CR12	210004	DIODE SILICO	SD4			DIODES IN SD4		
CR13	210004	DIODE SILICO	SD4			DIODES IN SD4		
CR14	210004	DIODE SILICO	SD4			DIODES IN SD4		
CR15	211083	DIODE SILICO	018		1	DANA	211083	
C01	130033	CAP GLASS	6.8 PFD	500 V	10%1	CORN	CYFN-10C6R8	
C02	130029	CAP GLASS	1-5 PFD	500 V	10%	LRC	682116	
C03	110017	CAP TANTA	1 MFD	35 V	10%1	KEMET	K1C35K	
C04	110038	CAP ELECT	50 MFD	15 V	20%	DUCATI	50-15	
C05	110001	CAP TANTA	6.8 MFD	35 V	10%1	KEMET	K6R8C35K	
C06	101641	CAP CERAM	470 PFD	500 V	10%1	AEROVOX	SCD1X5F	
C07	130039	CAP GLASS	27 PFD	500 V	10%	CORN	CYFM10C270J	
C08	130029	CAP GLASS	1-5 PFD	500 V	10%	LRC	682116	
C09	100006	CAP CERAM	10 PFD	500 V	10%1	AEROVOX	TCD-N750	
C10	130034	CAP CERAM	7-45 PFD	500 V	10%	CRL	822BN-N650	
C11	130040	CAP GLASS	240 PFD	300 V	10%	CORN	CYFM10C241J	
C13	130041	CAP GLASS	3000 PFD	500 V	10%	CORN	CYFM200302J	
C14	100006	CAP CERAM	10 PFD	500 V	10%1	AEROVOX	TCD-N750	
C15	101641	CAP CERAM	470 PFD	500 V	10%1	AEROVOX	SCD1X5F	
C16	110001	CAP TANTA	6.8 MFD	35 V	10%1	KEMET	K6R8C35K	
C17	100005	CAP CERAM	22 PFD	500 V	10%	AEROVOX	TCD-N750	
C18	110001	CAP TANTA	6.8 MFD	35 V	10%1	KEMET	K6R8C35K	
C19	110002	CAP TANTA	22 MFD	35 V	10%1	KEMET	K22C35K	
C20	110001	CAP TANTA	6.8 MFD	35 V	10%1	KEMET	K6R8C35K	
C21	120069	CAP MYLAR	.39 MFD	100 V	10%	IMB	XA1134K	
C22	130034	CAP CERAM	7-45 PFD	500 V	10%	CRL	822BN-N650	
K01	310013	RELAY REED	SPST	24V	1	WHEELOCK	2961A X6	
K02	310013	RELAY REED	SPST	24V	1	WHEELOCK	2961A X6	

PARTS LIST

ASSEMBLY 400706 PC Board Assy-AC Converter - Model 5500-112/130 A

REF. DESIG.	PART NO.	DESCRIPTION							
K03	310022	RELAY DC		4 PDT	29V			ALLIED	TS154-OC-CC
Q01	200035	TRANS SILICO	NPN	014				DANA	200035
Q02	200035	TRANS SILICO	NPN	014				DANA	200035
Q03	200035	TRANS SILICO	NPN	014				DANA	200035
Q04	200043	TRANS SILICO	NPN	2N3565				FAIRCHILD	2N3565
Q05	200043	TRANS SILICO	NPN	2N3565				FAIRCHILD	2N3565
Q06	200043	TRANS SILICO	NPN	2N3565				FAIRCHILD	2N3565
Q07	200043	TRANS SILICO	NPN	2N3565				FAIRCHILD	2N3565
Q08	200043	TRANS SILICO	NPN	2N3565				FAIRCHILD	2N3565
Q09	200011	TRANS SILICO	PNP	009				DANA	200011
Q10	200035	TRANS SILICO	NPN	014				DANA	200035
R01	000473	RES	CARBON	47 K	5%	1/4 W1		OHMITE	RC07GF473J
R02	010280	RES	METAL	MATCH SET				DANA	010280
R03	000473	RES	CARBON	47 K	5%	1/4 W1		OHMITE	RC07GF473J
R04	000684	RES	CARBON	680 K	5%	1/4 W		OHMITE	RC07GF684J
R05	000101	RES	CARBON	100 OHM	5%	1/4 W1		OHMITE	RC07GF101J
R06	000913	RES	CARBON	91 K	5%	1/4 W		OHMITE	RC07GF913J
R07	000470	RES	CARBON	47 OHM	5%	1/4 W1		OHMITE	RC07GF470J
R08	000682	RES	CARBON	6.8 K	5%	1/4 W1		OHMITE	RC07GF682J
R09	000272	RES	CARBON	2.7 K	5%	1/4 W		OHMITE	RC07GF272J
R10	000201	RES	CARBON	200 OHM	5%	1/4 W1		OHMITE	RC07GF201J
R11	010280	RES	METAL	MATCH SET				DANA	010280
R12	000913	RES	CARBON	91 K	5%	1/4 W		OHMITE	RC07GF913J
R13	010280	RES	METAL	MATCH SET				DANA	010280
R14	010280	RES	METAL	MATCH SET				DANA	010280
R15	000152	RES	CARBON	1.5 K	5%	1/4 W1		OHMITE	RC07GF152J
R16	000201	RES	CARBON	200 OHM	5%	1/4 W1		OHMITE	RC07GF201J
R17	000392	RES	CARBON	0003.9 K	5%	1/4 W1		OHMITE	RC07GF392J
R18	040053	RES	VARI	5 K	10%	1.5 W		CTS	110
R19	040062	RES	VARI	500 OHM	10%	1.5 W		CTS	110
R20	040052	RES	VARI	50 OHM	10%	1.5 W		CTS	110
R21	000153	RES	CARBON	15 K	5%	1/4 W1		OHMITE	RC07GF153J
R22	000330	RES	CARBON	33 K	5%	1/4 W		OHMITE	RC07GF330J
R23	000751	RES	CARBON	750 OHM	5%	1/4 W1		OHMITE	RC07GF751J
R24	000330	RES	CARBON	33 K	5%	1/4 W		OHMITE	RC07GF330J
R25	000432	RES	CARBON	4.3 K	5%	1/4 W1		OHMITE	RC07GF432J
R26	000103	RES	CARBON	10 K	5%	1/4 W1		OHMITE	RC07GF103J
R27	000910	RES	CARBON	91 OHM	5%	1/4 W1		OHMITE	RC07GF910J

PARTS LIST

ASSEMBLY 400706 PC Board Assy - AC Converter - Model 5500-112/130 A

REF. DESIG.	PART NO.	DESCRIPTION							
R28	000390	RES	CARBON	39	OHM	5%	1/4 W1	OHMITE	RC07GF390J
R29	020165	RES	WW	270	K	1%	1/8 W	KELVIN	EP-20
R30	020165	RES	WW	270	K	1%	1/8 W	KELVIN	EP-20
R31	020164	RES	WW	135	K	.1%	1/8 W	KELVIN	EP-20
R32	020164	RES	WW	135	K	.1%	1/8 W	KELVIN	EP-20
R33	000202	RES	CARBON	2	K	5%	1/4 W1	OHMITE	RC07GF202J
R34	001705	RES	CARBON	820	OHM	5%	1/2 W	OHMITE	RC20GF821J
R35	000152	RES	CARBON	1.5	K	5%	1/4 W1	OHMITE	RC07GF152J

PARTS LIST

ASSEMBLY 402102 - Model 5500-112/130

REF. DESIG.	PART NO.	DESCRIPTION						
CR1	211083	DIODE SILICO	018		1	DANA	211083
CR2	211083	DIODE SILICO	018		1	DANA	211083
CR3	211083	DIODE SILICO	018		1	DANA	211083
CR4	211083	DIODE SILICO	018		1	DANA	211083
CR5	211083	DIODE SILICO	018		1	DANA	211083
CR6	211083	DIODE SILICO	018		1	DANA	211083
CR7	211083	DIODE SILICO	018		1	DANA	211083
CR8	211083	DIODE SILICO	018		1	DANA	211083
CR9	220004	DIODE SILICO ZENER	1N961B		1	MOTOROLA	1N961B
CR10	211083	DIODE SILICO	018		1	DANA	211083
CR11	211083	DIODE SILICO	018		1	DANA	211083
CR12	210004	DIODE SILICO	SD4			DIODES IN SD4	
CR13	210004	DIODE SILICO	SD4			DIODES IN SD4	
CR14	210004	DIODE SILICO	SD4			DIODES IN SD4	
CR15	211083	DIODE SILICO	018		1	DANA	211083
CR16	211083	DIODE SILICO	018		1	DANA	211083
C1	130043	CAP GLASS	7.5 PFD	500 V	10%	CORN	CYFM10C7R7
C2	130029	CAP GLASS	1-5 PFD	500 V	10%	LRC	682116
C3	110017	CAP TANTA	1 MFD	35 V	10%1	KEMET	K1C35K
C4	110038	CAP ELECT	50 MFD	15 V	20%	DUCATI	50-15
C5	110001	CAP TANTA	6.8 MFD	35 V	10%1	KEMET	K6R8C35K
C6	101641	CAP CERAM	470 PFD	500 V	10%1	AEROVOX	SCD1X5F
C7	130039	CAP GLASS	27 PFD	500 V	10%	CORN	CYFM10C270J
C8	130029	CAP GLASS	1-5 PFD	500 V	10%	LRC	682116
C9	100006	CAP CERAM	10 PFD	500 V	10%1	AEROVOX	TCD-N750
C10	130034	CAP CERAM	7-45 PFD	500 V	10%	CRL	822BN-N650
C11	130040	CAP GLASS	240 PFD	300 V	10%	CORN	CYFM10C241J
C13	130041	CAP GLASS	3000 PFD	500 V	10%	CORN	CYFM200302J
C14	100006	CAP CERAM	10 PFD	500 V	10%1	AEROVOX	TCD-N750
C15	101641	CAP CERAM	470 PFD	500 V	10%1	AEROVOX	SCD1X5F
C16	110001	CAP TANTA	6.8 MFD	35 V	10%1	KEMET	K6R8C35K
C17	100005	CAP CERAM	22 PFD	500 V	10%	AEROVOX	TCD-N750
C18	110001	CAP TANTA	6.8 MFD	35 V	10%1	KEMET	K6R8C35K
C19	110101	CAP TANTA	47 MFD	35 V	10%1	KEMET	K47J35KS
C20	110001	CAP TANTA	6.8 MFD	35 V	10%1	KEMET	K6R8C35K
C21	120069	CAP MYLAR	.39 MFD	100 V	10%	IMB	XA1134K
C22	130034	CAP CERAM	7-45 PFD	500 V	10%	CRL	822BN-N650
C23	130027	CAP GLASS	10 PFD	500 V	10%	CORN	CYFM-10C100
K1	310013	RELAY REED	SPST	24V	1	WHEELOCK	2961A X6

PARTS LIST

ASSEMBLY 402103 - Model 5500-112/130

REF. DESIG.	PART NO.	DESCRIPTION							
K2	310013	RELAY REED			SPST	24V		WHEELOCK	2961A X6
K3	310022	RELAY DC			4 PDT	29V		ALLIED	TS154-OC-CC
Q1	200035	TRANS SILICO NPN			014			DANA	200035
Q2	200035	TRANS SILICO NPN			014			DANA	200035
Q3	200035	TRANS SILICO NPN			014			DANA	200035
Q4	200043	TRANS SILICO NPN			2N3565			FAIRCHILD	2N3565
Q5	200043	TRANS SILICO NPN			2N3565			FAIRCHILD	2N3565
Q6	200043	TRANS SILICO NPN			2N3565			FAIRCHILD	2N3565
Q7	200043	TRANS SILICO NPN			2N3565			FAIRCHILD	2N3565
Q8	200043	TRANS SILICO NPN			2N3565			FAIRCHILD	2N3565
Q9	200011	TRANS SILICO PNP			009			DANA	200011
Q10	200035	TRANS SILICO NPN			014			DANA	200035
R1	000473	RES	CARBON	47	K	5%	1/4 W1	OHMITE	RC07GF473J
R2	010280	RES	WW	329	K	.25%	1/8 W	PME	PME329KT2
R3	000473	RES	CARBON	47	K	5%	1/4 W1	OHMITE	RC07GF473J
R4	000684	RES	CARBON	680	K	5%	1/4 W	OHMITE	RC07GF684J
R5	000101	RES	CARBON	100	OHM	5%	1/4 W1	OHMITE	RC07GF101J
R6	000913	RES	CARBON	91	K	5%	1/4 W	OHMITE	RC07GF913J
R7	000470	RES	CARBON	47	OHM	5%	1/4 W1	OHMITE	RC07GF470J
R8	000682	RES	CARBON	6.8	K	5%	1/4 W1	OHMITE	RC07GF682J
R9	000272	RES	CARBON	2.7	K	5%	1/4 W	OHMITE	RC07GF272J
R10	000201	RES	CARBON	200	OHM	5%	1/4 W1	OHMITE	RC07GF201J
R11	010280	RES	WW	329	K	.25%	1/8 W	PME	PME329KT2
R12	000913	RES	CARBON	91	K	5%	1/4 W	OHMITE	RC07GF913J
R13	010280	RES	WW	329	K	.25%	1/8 W	PME	PME329KT2
R14	010280	RES	WW	329	K	.25%	1/8 W	PME	PME329KT2
R15	000152	RES	CARBON	1.5	K	5%	1/4 W1	OHMITE	RC07GF152J
R16	000201	RES	CARBON	200	OHM	5%	1/4 W1	OHMITE	RC07GF201J
R17	000392	RES	CARBON	0003.9	K	5%	1/4 W1	OHMITE	RC07GF392J
R18	040053	RES	VARI	5	K	10%	1.5 W	CTS	110
R19	040062	RES	VARI	500	OHM	10%	1.5 W	CTS	110
R20	040052	RES	VARI	50	OHM	10%	1.5 W	CTS	110
R21	000153	RES	CARBON	15	K	5%	1/4 W1	OHMITE	RC07GF153J
R22	000330	RES	CARBON	33	K	5%	1/4 W	OHMITE	RC07GF330J
R23	000751	RES	CARBON	750	OHM	5%	1/4 W1	OHMITE	RC07GF751J
R24	000330	RES	CARBON	33	K	5%	1/4 W	OHMITE	RC07GF330J
R25	000432	RES	CARBON	4.3	K	5%	1/4 W1	OHMITE	RC07GF432J
R26	000103	RES	CARBON	10	K	5%	1/4 W1	OHMITE	RC07GF103J

PARTS LIST

ASSEMBLY 402102 - Model 5500-112/130

REF. DESIG.	PART NO.	DESCRIPTION							
R27	000910	RES	CARBON	91	OHM	5%	1/4 W1	OHMITE	RC07GF910J
R28	000390	RES	CARBON	39	OHM	5%	1/4 W1	OHMITE	RC07GF390J
R29	020165	RES	WW	270	K	1%	1/8 W	KELVIN	EP-20
R30	020165	RES	WW	270	K	1%	1/8 W	KELVIN	EP-20
R31	020164	RES	WW	135	K	.1%	1/8 W	KELVIN	EP-20
R32	020164	RES	WW	135	K	.1%	1/8 W	KELVIN	EP-20
R33	000202	RES	CARBON	2	K	5%	1/4 W1	OHMITE	RC07GF202J
R34	001705	RES	CARBON	820	OHM	5%	1/2 W	OHMITE	RC20GF821J
R35	000152	RES	CARBON	1.5	K	5%	1/4 W1	OHMITE	RC07GF152J

PARTS LIST

ASSEMBLY 402036 **AUTO POLARITY** - Model 5500-112/130

REF. DESIG.	PART NO.	DESCRIPTION							
CR1	220012	DIODE	SILICO	ZENER	1N958B		1	MOTOROLA	1N958B
CR10	211236	DIODE	SILICO		007			DANA	211236
CR11	211083	DIODE	SILICO		018		1	DANA	211083
CR12	211083	DIODE	SILICO		018		1	DANA	211083
CR13	211083	DIODE	SILICO		018		1	DANA	211083
CR14	211083	DIODE	SILICO		018		1	DANA	211083
CR15	211083	DIODE	SILICO		018		1	DANA	211083
CR16	211083	DIODE	SILICO		018		1	DANA	211083
CR17	210014	DIODE	SILICO		023			DANA	210014
CR18	211083	DIODE	SILICO		018		1	DANA	211083
CR19	211083	DIODE	SILICO		018		1	DANA	211083
CR2	220012	DIODE	SILICO	ZENER	1N958B		1	MOTOROLA	1N958B
CR3	210010	DIODE	GE		S-322			G.E.	S368
CR4	210010	DIODE	GE		S-322			G.E.	S368
CR5	221177	DIODE	SILICO	ZENER		1/4 W1		MOTOROLA	M.2.4A25
CR6	220007	DIODE	SILICO	ZENER	1N751		1	MOTOROLA	1N751
CR7	210011	DIODE	SILICO		1N916			G.E.	DHO916
CR8	210011	DIODE	SILICO		1N916			G.E.	DHO916
CR9	211236	DIODE	SILICO		007			DANA	211236
C01	110039	CAP	ELECT		5 MFD 50 V	20%		DUCATI	5-50
C02	110039	CAP	ELECT		5 MFD 50 V	20%		DUCATI	5-50
C03	120155	CAP	POLYS		36 PFD 500 V			MALLORY	SX436
C04	120155	CAP	POLYS		36 PFD 500 V			MALLORY	SX436
C05	101145	CAP	CERAM		100 PFD 500 V	10%1		AEROVOX	SCD1X5F
C06	100012	CAP	CERAM		33 PFD 500 V	10%		AEROVOX	TCD-N750
C07	101641	CAP	CERAM		470 PFD 500 V	10%1		AEROVOX	SCD1X5F
C08	101174	CAP	CERAM		.001 MFD 500 V	10%1		AEROVOX	SCD3X5F
C11	100010	CAP	CERAM		68 PFD 500 V	10%		AERVOX	TCD-N750
C12	100010	CAP	CERAM		68 PFD 500 V	10%		AERVOX	TCD-N750
C13	110044	CAP	ELECT		50 MFD 50 V	20%		DUCATI	50-50
C14	120005	CAP	MYLAR		.001 MFD 100 V	10%1			WMF1D1
C15	120005	CAP	MYLAR		.001 MFD 100 V	10%1			WMF1D1
C16	101174	CAP	CERAM		.001 MFD 500 V	10%		AERVOX	SCD3X5F
C17	100019	CAP	CERAM		.002 MFD 1000 V			SPRAGUE	5FA-D20
C18	121393	CAP	MYLAR		.22 MFD 100 V	10%		CDE	WMF1P22
C19	101174	CAP	CERAM		.001 MFD 500 V	10%1		AERVOX	SCD3X5F
K01	311274	RELAY	DC		2 PDT 26V			BABCOCK	BR12H-1.6KC
Q01	201084	TRANS	GERMAN	PNP	2N1304		1	TI	2N1304
Q02	200027	TRANS	SILICO		PSV			DANA	200027

PARTS LIST

ASSEMBLY 402036 **AUTO POLARITY** - Model 5500-112/130

REF. DESIG.	PART NO.	DESCRIPTION							
Q03	200036	TRANS SILICO NPN			015			DANA	200036
Q04	200040	TRANS SILICO NPN			016			DANA	200040
Q05	200043	TRANS SILICO NPN			2N3565			FAIRCHILD	2N3565
Q06	200011	TRANS SILICO PNP			009			DANA	200011
Q07	200035	TRANS SILICO NPN			014			DANA	200035
Q08	200011	TRANS SILICO PNP			009			DANA	200011
Q09	200035	TRANS SILICO NPN			014			DANA	200035
Q10	200126	TRANS SILICO DUAL FSV						DANA	200126
Q11	200126	TRANS SILICO DUAL FSV						DANA	200126
Q12	200037	TRANS SILICO NPN			2N3646			FAIRCHILD	2N3646
Q13	200037	TRANS SILICO NPN			2N3646			FAIRCHILD	2N3646
Q14	200082	TRANS						GE	2N4424
Q15	200035	TRANS SILICO NPN			014			DANA	200035
Q16	200082	TRANS						GE	2N4424
Q17	200043	TRANS SILICO NPN			2N3565			FAIRCHILD	2N3565
Q18	200032	TRANS SILICO NPN			005			DANA	200032
R01	020378	TRANS SILICO NPN			RESISTOR SET			JORDAN	LR-11
RO2	020379	RES	WW	20 OHM	.01%			JORDAN	J11
R03	040050	RES	VARI	5 K	10%	1/2 W		BOURNS	3067-P-1-KO
R04	000203	RES	CARBON	20 K	5%	1/4 W1		OHMITE	RCO7GF203J
R05	000101	RES	CARBON	100 OHM	5%	1/4 W1		OHMITE	RCO7GF101J
R06	010079	RES	METAL	7.5 K	1%	1/4 W1		ELECTRA	RN60D7501F
R07	040004	RES	VARI	100 K	10%	1/5 W		BOURNS	3068-P-1-10
R08	020378	TRANS SILICO NPN			RESISTOR SET			JORDAN	LR-11
R09	010111	RES	METAL	1 MEG	1%			CORNING	RN65C1004F
R10	020378	RES	WW		RESISTOR SET			JORDAN	LR-11
R11	040050	RES	VARI	5 K	10%	1/2 W		BOURNS	3067-P-1-KO
R12	001713	RES	FSV		5%	1/4 W	DANA	001713	
R13	010158	RES	METAL	200 K	1%	1/4 W1		ELECTRA	RN60D2003F
R14	010282	RES	METAL	140 K	1%	1/4 W		IRC	RN60C1403F
R15	001713	RES	FSV		5%	1/4 W	DANA	001713	
R16	010158	RES	METAL	200 K	1%	1/4 W1		ELECTRA	RN60D2003F
R17	000102	RES	CARBON	1 K	5%	1/4 W1		OHMITE	RCO7GF102J
R18	010167	RES	METAL	442 K	1%	1/4 W1		ELECTRA	RN60D4423F
R19	010060	RES	METAL	10 K	1%	1/4 W		ELECTRA	RN60D1002F
R20	010039	RES	METAL	9.09 K	1%	1/4 W		ELECTRA	RN60D9091F
R21	000102	RES	CARBON	1 K	5%	1/4 W1		OHMITE	RCO7GF102J
R22	010167	RES	METAL	442 K	1%	1/4 W1		ELECTRA	RN60D4423F
R23	000203	RES	CARBON	20 K	5%	1/4 W1		OHMITE	RCO7GF203J

PARTS LIST

ASSEMBLY 402036 **AUTO POLARITY**- Model 5500-112/130

REF. DESIG.	PART NO.	DESCRIPTION						
R24	001712	RES	CARBON	750 OHM	5%	1/2 W	OHMITE	RC20GF751J
R25	000220	RES	CARBON	22 OHM	5%	1/4 W1	OHMITE	RC07GF220J
R26	000820	RES	CARBON	82 OHM	5%	1/4 W	OHMITE	RC07GF820J
R27	000101	RES	CARBON	100 OHM	5%	1/4 W1	OHMITE	RC07GF101J
R28	000220	RES	CARBON	22 OHM	5%	1/4 W1	OHMITE	RC07GF220J
R30	000220	RES	CARBON	22 OHM	5%	1/4 W1	OHMITE	RC07GF220J
R31	000101	RES	CARBON	100 OHM	5%	1/4 W1	OHMITE	RC07GF101J
R32	000222	RES	CARBON	2.2 K	5%	1/4 W1	OHMITE	RC07GF222J
R33	001674	RES	CARBON	680 OHM	5%	1/2 W1	OHMITE	RC20GF681J
R34	000103	RES	CARBON	10 K	5%	1/4 W1	OHMITE	RC07GF103J
R35	000203	RES	CARBON	20 K	5%	1/4W1	OHMITE	RC07GF203J
R36	000153	RES	CARBON	15 K	5%	1/4 W1	OHMITE	RC07GF153J
R37	000153	RES	CARBON	15 K	5%	1/4 W1	OHMITE	RC07GF153J
R38	000153	RES	CARBON	15 K	5%	1/4 W1	OHMITE	RC07GF153J
R39	000822	RES	CARBON	8.2 K	5%	1/4 W1	OHMITE	RC07GF822J
R40	000303	RES	CARBON	30 K	5%	1/4 W1	OHMITE	RC07GF303J
R41	000123	RES	CARBON	12 K	5%	1/4 W1	OHMITE	RC07GF123J
R42	000822	RES	CARBON	8.2 K	5%	1/4 W1	OHMITE	RC07GF822J
R43	000303	RES	CARBON	30 K	5%	1/4 W1	OHMITE	RC07GF303J
R44	000123	RES	CARBON	12 K	5%	1/4 W1	OHMITE	RC07GF123J
R45	000163	RES	CARBON	16 K	5%	1/4 W1	OHMITE	RC07GF163J
R46	000102	RES	CARBON	1 K	5%	1/4 W1	OHMITE	RC07GF102J
R47	000105	RES	CARBON	1 M	5%	1/4 W1	OHMITE	RC07GF105J
R48	000822	RES	CARBON	8.2 K	5%	1/4 W1	OHMITE	RC07GF822J
R49	040003	RES	VARI	20 K	10%	1/2 W	BOURNS	3067-P-1-20
R50	000822	RES	CARBON	8.2 K	5%	1/4 W1	OHMITE	RC07GF822J
R52	000563	RES	CARBON	56 K	5%	1/4 W	OHMITE	RC07GF563J
R53	000273	RES	CARBON	27 K	5%	1/4 W1	OHMITE	RC07GF273J
R54	000273	RES	CARBON	27 K	5%	1/4 W1	OHMITE	RC07GF273J
R55	000163	RES	CARBON	16 K	5%	1/4 W1	OHMITE	RC07GF163J
R56	000303	RES	CARBON	30 K	5%	1/4 W1	OHMITE	RC07GF303J
R57	000163	RES	CARBON	16 K	5%	1/4 W1	OHMITE	RC07GF163J
R58	000153	RES	CARBON	15 K	5%	1/4 W1	OHMITE	RC07GF153J
R59	000123	RES	CARBON	12 K	5%	1/4 W1	OHMITE	RC07GF123J
R60	000202	RES	CARBON	2 K	5%	1/4 W1	OHMITE	RC07GF202J
R61	000680	RES	CARBON	68 OHM	5%	1/4 W1	OHMITE	RC07GF680J
R62	000202	RES	CARBON	2 K	5%	1/4 W1	OHMITE	RC07GF202J
R63	000822	RES	CARBON	8.2 K	5%	1/4 W1	OHMITE	RC07GF822J

PARTS LIST

ASSEMBLY 402036 **AUTO POLARITY** - Model 5500-112/130

REF. DESIG.	PART NO.	DESCRIPTION						
R64	000163	RES	CARBON	16 K	5%	1/4 W1	OHMITE	RC07GF163J
R65	000153	RES	CARBON	15 K	5%	1/4 W1	OHMITE	RC07GF153J
R67	000222	RES	CARBON	2.2 K	5%	1/4 W1	OHMITE	RC07GF222J
R68	000154	RES	CARBON	150K	5%	1/4 W 1	OHMITE	RCO7GF154J
R69	000243	RES	CARBON	24 K	5%	1/4 W1	OHMITE	RCO7GF243J
R70	000243	RES	CARBON	24 K	5%	1/4 W1	OHMITE	RCO7GF243J
R71	000161	RES	CARBON	160 OHMS	5%	1/4 W1	OHMITE	RCO7GF161J
R72	000222	RES	CARBON	2.2 K	5%	1/4 W1	OHMITE	RCO7GF222J

PARTS LIST

ASSEMBLY 402101 - Model 5500-112/130

A

REF. DESIG.	PART NO.	DESCRIPTION							
C03	121146	Cap	MYLAR	.0047 MFD	100 V	10%1		CDE	WMF1D47
C04	101174	Cap	CERAM	.001 MFD	500 V	10%1		AEROVOX	SCD3X5F
C05	101174	Cap	CERAM	.001 MFD	500 V	10%1		AEROVOX	SCD3X5F
C06	101145	Cap	CERAM	100 PFD	500 V	10%1		AEROVOX	SCD1X5F
CR01	211083	Diode	SILICO	018		1		DANA	211083
CR02	211083	Diode	SILICO	018		1		DANA	211083
CR03	211083	Diode	SILICO	018		1		DANA	211083
CR37	210004	Diode	SILICO	SD4			DIODES IN SD4		
CR38	210004	Diode	SILICO	SD4			DIODES IN SD4		
CR39	211083	Diode	SILICO	018		1		DANA	211083
CR40	211083	Diode	SILICO	018		1		DANA	211083
CR41	211083	Diode	SILICO	018		1		DANA	211083
CR42	211083	Diode	SILICO	018		1		DANA	211083
CR43	211083	Diode	SILICO	018		1		DANA	211083
CR44	211083	Diode	SILICO	018		1		DANA	211083
CR45	221177	Diode	SILICO ZENER			1/4 W1		MOTOROLA	M.2.4A25
CR46	220011	Diode	SILICO ZENER	1N968A		1		MOTOROLA	1N968A
F01	920054	Fuse		.1 AMP			BUSS	BMW 1/10	
K01	310013	Relay	REED	SPST	24V	1		WHEELOCK	2961A X6
K02	310013	Relay	REED	SPST	24V	1		WHEELOCK	2961A X6
K03	310013	Relay	REED	SPST	24V	1		WHEELOCK	2961A X6
K04	310013	Relay	REED	SPST	24V	1		WHEELOCK	2961A X6
Q07	200035	Trans	SILICO NPN	014				DANA	200035
Q08	200035	Trans	SILICO NPN	014				DANA	200035
Q09	200035	Trans	SILICO NPN	014				DANA	200035
Q10	200035	Trans	SILICO NPN	014				DANA	200035
Q11	200040	Trans	SILICO NPN	016				DANA	200040
Q12	200043	Trans	SILICO NPN	2N3565				FAIRCHILD	2N3565
Q13	200043	Trans	SILICO NPN	2N3565				FAIRCHILD	2N3565
Q14	200043	Trans	SILICO NPN	2N3565				FAIRCHILD	2N3565
Q15	200043	TRANS	SILICO NPN	2N3565				FAIRCHILD	2N3565
Q16	200043	TRANS	SILICO NPN	2N3565				FAIRCHILD	2N3565
Q17	200043	TRANS	SILICO NPN	2N3565				FAIRCHILD	2N3565
Q18	200035	TRANS	SILICO NPN	014				DANA	200035
Q19	200011	TRANS	SILICO PNP	009				DANA	200011
Q20	200035	TRANS	SILICO NPN	014				DANA	200035
R08	000473	RES	CARBON	47 K	5%	1/4 W1		OHMITE	RC07GF473J
R16	010288	RES	METAL	5 M	1%	1 W		PYROFILM	PME75T2

PARTS LIST

ASSEMBLY 402101 - Model 5500-112/130 A

REF. DESIG.	PART NO.	DESCRIPTION							
R17	040003	RES	VARI	20 K	10%	1/2 W		BOURNS	3067-P-1-203
R18	020372	RES	WW	20 K	.01%			JORDAN	J11
R19	020375	RES	WW	5.010 K	.01%			JORDAN	J11
R20	020375	RES	WW	5.010 K	.01%			JORDAN	J11
R21	020372	RES	WW	20 K	.01%			JORDAN	J11
R22	010289	RES	METAL	555.5 K	.1%	1/2 W		PYROFILM	PME65T2
R23	040049	RES	VARI	2 K	10%	1/2 W		BOURNS	3067-P-1-202
R24	010246	RES	METAL	54.9 K	1%	1/4 W		ELECTRA	RN60D5492F
R25	040005	RES	VARI	10 K	10%	1/2 W		BOURNS	3067-P-1-103
R26	000242	RES	CARBON	2.4 K	5%	1/4 W1		OHMITE	RC07GF242J
R27	010246	RES	METAL	54.9 K	1%	1/4 W		ELECTRA	RN60D5492F
R28	020238	RES	WW	50.5 K	.1%	1/8 W		JORDAN	J-11
R29	040084	RES	VARI	200 OHM	10%	1/2 W		BOURNS	3067P-1-20
R30	000623	RES	CARBON	6.2 K	5%	1/2 W		OHMITE	RC07GF623J
R31	000152	RES	CARBON	1.5 K	5%	1/4 W1		OHMITE	RC07GF152J
R32	020366	RES	WW	4.985 K	.1%			JORDAN	J11
R33	040050	RES	VARI	5 K	10%	1/2 W		BOURNS	3067-P-1-K02
R34	000202	RES	CARBON	2 K	5%	1/4 W1		OHMITE	RC07GF202J
R35	020365	RES	WW	489.5 OHM	.1%			JORDAN	J11
R36	040050	RES	VARI	5 K	10%	1/2 W		BOURNS	3067-P-1-K02
R37	000163	RES	CARBON	16 K	5%	1/4 W1		OHMITE	RC07GF163J
R38	000163	RES	CARBON	16 K	5%	1/4 W1		OHMITE	RC07GF163J
R39	000333	RES	CARBON	33 K	5%	1/4 W		OHMITE	RC07GF333J
R40	000271	RES	CARBON	270 OHM	5%	1/4 W		OHMITE	RC07GF271J
R41	000182	RES	CARBON	1.8 K	5%	1/4 W1		OHMITE	RC07GF182J
R42	000681	RES	CARBON	680 OHM	5%	1/4 W1		OHMITE	RC07GF681J
R43	000200	RES	CARBON	20 OHM	5%	1/4 W		OHMITE	RC07GF200J
R44	000472	RES	CARBON	4.7 K	5%	1/4 W1		OHMITE	RC07GF472J
R45	010321	RES	METAL	10 OHM	1%			ELECTRA	RN60D10R0F
R46	920054	FUSE		.1 AMP				BUSS	BMW 1/10

PARTS LIST

ASSEMBLY 402551 - Model 5500-112/130 A

REF. DESIG.	PART NO.	DESCRIPTION							
C1	101174	CAP	CERAM	.001 MFD	500 V	10%		AEROVOX	SCD3X5F
C2	121473	CAP	MYLAR	.0015 MFD	100 V	10%1		CDE	WMF1S47
C3	110001	CAP	TANTA	6.8 MFD	35 V	10%1		KEMET	K6R8C35K
C4	121473	CAP	MYLAR	.0015 MFD	100 V	10%1		CDE	WMF1S47
C5	110001	CAP	TANTA	6.8 MFD	35 V	10%1		KEMET	K6R8C35K
C6	101174	CAP	CERAM	.001 MFD	500 V	10%		AEROVOX	SCD3X5F
C7	120094	CAP	POLYS	.0051 MFD	500 V			CRL	CPR-5100J
CR1	211083	DIODE	SILICO	018			1	DANA	211083
CR2	211083	DIODE	SILICO	018			1	DANA	211083
CR3	211083	DIODE	SILICO	018			1	DANA	211083
CR13	210004	DIODE	SILICO	SD4				DIODES IN SD4	
CR14	210004	DIODE	SILICO	SD4				DIODES IN SD4	
CR15	211083	DIODE	SILICO	018			1	DANA	211083
CR16	211083	DIODE	SILICO	018			1	DANA	211083
CR17	211083	DIODE	SILICO	018			1	DANA	211083
CR18	211083	DIODE	SILICO	018			1	DANA	211083
CR19	211236	DIODE	SILICO	007				DANA	211236
CR20	211236	DIODE	SILICO	007				DANA	211236
CR21	221254	DIODE	SILICO	ZENER	1N961A		1	MOTOROLA	1N961A
CR22	221254	DIODE	SILICO	ZENER	1N961A		1	MOTOROLA	1N961A
CR23	211083	DIODE	SILICO	018				DANA	211083
CR24	211083	DIODE	SILICO	018				DANA	211083
F1	920054	FUSE		.1 AMP				BUSS	BMW 1/10
F2	920260	FUSE		.5 AMP				MICROFUSE	
K1	310013	RELAY	REED	SPST	24V		1	WHEELOCK	2961A X6
K2	310013	RELAY	REED	SPST	24V		1	WHEELOCK	2961A X6
K3	310013	RELAY	REED	SPST	24V		1	WHEELOCK	2961A X6
K4	310024	RELAY	REED	SPST	24V			DANA	310024
Q1	200035	TRANS	SILICO	NPN	014			DANA	200035
Q2	200035	TRANS	SILICO	NPN	014			DANA	200035
Q3	200035	TRANS	SILICO	NPN	014			DANA	200035
Q4	200035	TRANS	SILICO	NPN	014			DANA	200035
Q5	201084	TRANS	GERMAN	PNP	2N1304		1	TI	2N1304
Q6	200027	TRANS	SILICO	FSV				DANA	200027
Q7	200040	TRANS	SILICO	NPN	016			DANA	200040
Q8	200040	TRANS	SILICO	NPN	016			DANA	200040
Q09	200043	TRANS	SILICO	NPN	2N3565			FAIRCHILD	2N3565
Q10	200043	TRANS	SILICO	NPN	2N3565			FAIRCHILD	2N3565
Q11	200043	TRANS	SILICO	NPN	2N3565			FAIRCHILD	2N3565

PARTS LIST

ASSEMBLY 402551 - Model 5500-112/130 A

REF. DESIG.	PART NO.	DESCRIPTION							
Q12	200022	TRANS SILICO PNP			012			DANA	200022
Q13	200052	TRANS SILICO PNP			009			DANA	200052
R8	000473	RES	CARBON	47 K	5%	1/4 W1		OHMITE	RC07GF473J
R9	010339	RES	METAL	10.104 MEG	.1%	1 W		PYROFILM	PME75
R10	040005	RES	VARI	10 K	10%	1/2W		BOURNS	3067-P1-103
R11	010338	RES	METAL	1 MEG	1%	1 W		PYROFILM	PME75
R12	020403	RES	WW	201.0 K	.1%	1/8 W		JORDAN	J11
R13	020399	RES	WW	20.153 K	.1%	1/8 W		JORDAN	J11
R14	020438	RES	WW	2.0088 K	.1%			JORDAN	J14
R15	040004	RES	VARI	100 K	10U	1/5 W		BOURNS	3068-P-1-10
R16	020401	RES	WW	10.34 K	.1%	1/8 W		JORDAN	J11
R17	020386	RES	WW	10 K	.1%	1/8 W		JORDAN	J11
R18	040066	RES	VARI	1 K	10%	1/4 W		BOURNS	271-P-1-166
R19	040084	RES	VARI	200 OHM	10%	1/2 W		BOURNS	3067P-1-20
R20	040055	RES	VARI	500 K	10%	1/5 W		BOURNS	3068-P-1-50
R21	010158	RES	METAL	200 K	1%	1/4 W1		ELECTRA	RN60D2003F
R22	000432	RES	CARBON	4.3 K	5%	1/4 W1		OHMITE	RC07GF432J
R23	000511	RES	CARBON	510 OHM	5%	1/4 W1		OHMITE	RC07GF511J
R24	000103	RES	CARBON	10 K	5%	1/4 W1		OHMITE	RC07GF103J
R25	000681	RES	CARBON	680 OHM	5%	1/4 W1		OHMITE	RC07GF681J
R26	010320	RES	METAL	25 M	1%			PME	PME70
R27	040004	RES	VARI	100 K	10U	1/5 W		BOURNS	3068-P-1-10
R28	010039	RES	METAL	9.09 K	1%	1/4 W		ELECTRA	RN60D9091F
R29	010236	RES	WW	10 MEG	1%	1 W1		PME	PME70T2
R30	040059	RES	VARI	1 M	10%	1/5 W		BOURNS	3068-P-1-10
R31	010236	RES	WW	10 MEG	1%	1 W1		PME	PME70T2
R32	010236	RES	WW	10 MEG	1%	1 W1		PME	PME70T2
R33	000513	RES	CARBON	51 K	5%	1/4 W1		OHMITE	RC07GF513J
R34	010158	RES	METAL	200 K	1%	1/4 W1		ELECTRA	RN60D2003F
R35	000202	RES	CARBON	2 K	5%	1/4 W1		OHMITE	RC07GF202J
R36	000513	RES	CARBON	51 K	5%	1/4 W1		OHMITE	RC07GF513J
R37	000151	RES	CARBON	150 OHM	5%	1/4 W1		OHMITE	RC07GF151J
R38	000151	RES	CARBON	150 OHM	5%	1/4 W1		OHMITE	RC07GF151J
R39	000473	RES	CARBON	47 K	5%	1/4 W1		OHMITE	RC07GF473J
R40	000152	RES	CARBON	1.5 K	5%	1/4 W1		OHMITE	RC07GF152J
R41	000202	RES	CARBON	2 K	5%	1/4 W1		OHMITE	RC07GF202J
R42	000822	RES	CARBON	8.2 K	5%	1/4 W1		OHMITE	RC07GF822J
R43	020119	RES	WW	680 OHM	1%	1/2 W1		CF ELEC	M-20

PARTS LIST

ASSEMBLY 402551 - Model 5500-112/130 A

REF. DESIG.	PART NO.	DESCRIPTION						
R44	000332	RES	CARBON	3.3 K	5%	1/4 W1	OHMITE	RC07GF332J
R45	000101	RES	CARBON	100 OHM	5%	1/4 W1	OHMITE	RC07GF101J
R47	000182	RES	CARBON	1.8 K	5%	1/4W	OHMITE	RC07GF182J
R48	000821	RES	CARBON	820 OHM	5%	1/4W	OHMITE	RC07GF821J
R49	000275	RES	CARBON	2.7 M	5%	1/4W	OHMITE	RC07GF275J
R50	000364	RES	CARBON	360 K	5%	1/4W	OHMITE	RC07GF364J
R51	000513	RES	CARBON	51 K	5%	1/4W	OHMITE	RC07GF513J
R52	020469	RES	WW	121 K	.1%		JORDAN	J11
R53	001737	RES	FSV		5%	1/4 W	DANA	001737
R54	001737	RES	FSV		5%	1/4W	DANA	001737
R55	001737	RES	FSV		5%	1/4W	DANA	001737
R56	000472	RES	CARBON	4.7 K	5%	1/4 W	OHMITE	RC07GF472J

PARTS LIST

ASSEMBLY 402100 - PC Board Assembly, Function Indicator - Model 5500-112/130

REF. DESIG.	PART NO.	DESCRIPTION							
DS1	920116	LAMP	NEON		NE-2H			G E	MPG250-3
DS2	920116	LAMP	NEON		NE-2H			G E	MPG250-3
DS3	920116	LAMP	NEON		NE-2H			G E	MPG250-3
DS4	920116	LAMP	NEON		NE-2H			G E	MPG250-3
DS5	920116	LAMP	NEON		NE-2H			G E	MPG250-3
DS6	920116	LAMP	NEON		NE-2H			G E	MPG250-3
R46	000914	RES	CARBON	910 K		5%	1/4 W1	OHMITE	RC07GF914J
R47	000914	RES	CARBON	910 K		5%	1/4 W1	OHMITE	RC07GF914J
R48	000914	RES	CARBON	910 K		5%	1/4 W1	OHMITE	RC07GF914J
R49	000914	RES	CARBON	910 K		5%	1/4 W1	OHMITE	RC07GF914J
R50	000914	RES	CARBON	910 K		5%	1/4 W1	OHMITE	RC07GF914J
R51	000914	RES	CARBON	910 K		5%	1/4 W1	OHMITE	RC07GF914J

PARTS LIST

ASSEMBLY 400890 - Model 5500-112/130

A

REF. DESIG.	PART NO.	DESCRIPTION						
C01	110041	CAP	ELECT	250 MFD	6 V	20%	DUCATI	250-6
CR1	210004	DIODE	SILICO	SD4			DIODES IN SD4	
CR2	210004	DIODE	SILICO	SD4			DIODES IN SD4	
CR3	210004	DIODE	SILICO	SD4			DIODES IN SD4	
R01	001107	RES	CARBON	39 K	5%	1 W	OHMITE	RC32GF393J
R02	001698	RES	CARBON	20 K	5%	1 W	OHMITE	RC32GF203J
R03	000224	RES	CARBON	220 K	5%	1/4 W1	OHMITE	RC07GF224J
R04	001107	RES	CARBON	39 K	5%	1 W	OHMITE	RC32GF393J
R05	001698	RES	CARBON	20 K	5%	1 W	OHMITE	RC32GF203J
R06	030005	RES	CARBON	100 K	5%	2 W	OHMITE	RC42GF104J
R07	030005	RES	CARBON	100 K	5%	2 W	OHMITE	RC42GF104J
R08	030005	RES	CARBON	100 K	5%	2 W	OHMITE	RC42GF104J
R09	030012	RES	CARBON	130 K	5%	1 W	OHMITE	RC32GF134J
R10	030012	RES	CARBON	130 K	5%	1 W	OHMITE	RC32GF134J
R11	030012	RES	CARBON	130 K	5%	1 W	OHMITE	RC32GF134J
R12	000914	RES	CARBON	910 K	5%	1/4 W	OHMITE	RC07GF914J
R13	000914	RES	CARBON	910 K	5%	1/4 W	OHMITE	RC07GF914J
R14	000914	RES	CARBON	910 K	5%	1/4 W	OHMITE	RC07GF914J
R15	000914	RES	CARBON	910 K	5%	1/4 W	OHMITE	RC07GF914J
R16	000914	RES	CARBON	910 K	5%	1/4 W	OHMITE	RC07GF914J
R17	000914	RES	CARBON	910 K	5%	1/4 W	OHMITE	RC07GF914J
R18	000914	RES	CARBON	910 K	5%	1/4 W	OHMITE	RC07GF914J

PARTS LIST

ASSEMBLY 400891 DECADE - Model 5500-112/130 A

REF. DESIG.	PART NO.	DESCRIPTION						
C01	101182	CAP	CERAM	47 PFD	500 V	10%1	AEROVOX	TCD-N750
E-C01	100005	CAP	CERAM	22 PFD	500 V	10%	AEROVOX	TCD-N750
CR01	211083	DIODE	SILICO	018		1	DANA	211083
CR02	211083	DIODE	SILICO	018		1	DANA	211083
CR03	211083	DIODE	SILICO	018		1	DANA	211083
CR04	211083	DIODE	SILICO	018		1	DANA	211083
CR25	211083	DIODE	SILICO	018		1	DANA	211083
CR36	211083	DIODE	SILICO	018		1	DANA	211083
CR37	211083	DIODE	SILICO	018		1	DANA	211083
CR38	211083	DIODE	SILICO	018		1	DANA	211083
CR39	211083	DIODE	SILICO	018		1	DANA	211083
CR40	211083	DIODE	SILICO	018		1	DANA	211083
CR41	211083	DIODE	SILICO	018		1	DANA	211083
CR42	211083	DIODE	SILICO	018		1	DANA	211083
CR43	211083	DIODE	SILICO	018		1	DANA	211083
CR44	211083	DIODE	SILICO	018		1	DANA	211083
CR45	211083	DIODE	SILICO	018		1	DANA	211083
CR46	211083	DIODE	SILICO	018		1	DANA	211083
CR47	211083	DIODE	SILICO	018		1	DANA	211083
CR48	211083	DIODE	SILICO	018		1	DANA	211083
Q01	200037	TRANS	SILICO	NPN	2N3646		FAIRCHILD	2N3646
Q02	200037	TRANS	SILICO	NPN	2N3646		FAIRCHILD	2N3646
Q04	200079	TRANS			021		DANA	200079
R11	000204	RES	CARBON	200 K	5%	1/4 W	OHMITE	RC07GF204J
R12	000103	RES	CARBON	10 K	5%	1/4 W1	OHMITE	RC07GF103J
R13	000103	RES	CARBON	10 K	5%	1/4 W1	OHMITE	RC07GF103J
R14	001698	RES	CARBON	20 K	5%	1 W	OHMITE	RC32GF203J
R15	001107	RES	CARBON	39 K	5%	1 W	OHMITE	RC32GF393J
R16	000103	RES	CARBON	10 K	5%	1/4 W1	OHMITE	RC07GF103J
R17	000103	RES	CARBON	10 K	5%	1/4 W1	OHMITE	RC07GF103J
R18	000103	RES	CARBON	10 K	5%	1/4 W1	OHMITE	RC07GF103J
R19	001107	RES	CARBON	39 K	5%	1 W	OHMITE	RC32GF393J
R20	001698	RES	CARBON	20 K	5%	1 W	OHMITE	RC32GF203J
R21	000103	RES	CARBON	10 K	5%	1/4 W1	OHMITE	RC07GF103J
R22	000103	RES	CARBON	10 K	5%	1/4 W1	OHMITE	RC07GF103J
R23	000103	RES	CARBON	10 K	5%	1/4 W1	OHMITE	RC07GF103J
R24	000103	RES	CARBON	10 K	5%	1/4 W1	OHMITE	RC07GF103J
R25	000103	RES	CARBON	10 K	5%	1/4 W1	OHMITE	RC07GF103J
R26	000103	RES	CARBON	10 K	5%	1/4 W1	OHMITE	RC07GF103J

PARTS LIST

ASSEMBLY 400891 DECADE - Model 5500-112/130 A

REF. DESIG.	PART NO.	DESCRIPTION							
R27	000223	RES	CARBON	22 K	5%	1/4 W		OHMITE	RC07GF223J
R28	000223	RES	CARBON	22 K	5%	1/4 W		OHMITE	RC07GF223J
R29	000223	RES	CARBON	22 K	5%	1/4 W		OHMITE	RC07GF223J
R30	000223	RES	CARBON	22 K	5%	1/4 W		OHMITE	RC07GF223J
R31	000683	RES	CARBON	68 K	5%	1/4 W1		OHMITE	RC07GF683J
R32	000563	RES	CARBON	56 K	5%	1/4 W		OHMITE	RC07GF563J
R33	000473	RES	CARBON	47 K	5%	1/4 W1		OHMITE	RC07GF473J
R34	000473	RES	CARBON	47 K	5%	1/4 W1		OHMITE	RC07GF473J
R35	000473	RES	CARBON	47 K	5%	1/4 W1		OHMITE	RC07GF473J
R36	000473	RES	CARBON	47 K	5%	1/4 W1		OHMITE	RC07GF473J
R37	000473	RES	CARBON	47 K	5%	1/4 W1		OHMITE	RC07GF473J
R38	000204	RES	CARBON	200 K	5%	1/4 W		OHMITE	RC07GF204J
R01	000122	RES	CARBON	1.2 K	5%	1/4 W1		OHMITE	RC07GF122J
R02	000153	RES	CARBON	15 K	5%	1/4 W1		OHMITE	RC07GF153J
R03	000122	RES	CARBON	1.2 K	5%	1/4 W1		OHMITE	RC07GF122J
R04	000153	RES	CARBON	15 K	5%	1/4 W1		OHMITE	RC07GF153J
R08	000243	RES	CARBON	24 K	5%	1/4 W1		OHMITE	RC07GF243J
R09	000273	RES	CARBON	27 K	5%	1/4 W1		OHMITE	RC07GF273J

PARTS LIST

ASSEMBLY 400896 **DAC** - Model 5500-112/130

REF. DESIG.	PART NO.	DESCRIPTION							
CR1	211083	DIODE SILICO			018		1	DANA	211083
CR2	211083	DIODE SILICO			018		1	DANA	211083
Q01	200043	TRANS SILICO	NPN		2N3565			FAIRCHILD	2N3565
Q02	200055	TRANS SILICO	NPN		FSV			DANA	200055
Q03	200067	TRANS			PNP	019		DANA	200067
R01	000473	RES	CARBON	47 K	5%	1/4 W1		OHMITE	RC07GF473J
R02	000153	RES	CARBON	15 K	5%	1/4 W1		OHMITE	RC07GF153J
R03	000753	RES	CARBON	75 K	5%	1/4 W		OHMITE	RC07GF753J
R04	000204	RES	CARBON	200 K	5%	1/4 W		OHMITE	RC07GF204J
R05	010033	RES	METAL	49.9 K	1%	1/4 W		ELECTRA	RN60D4992F
R6	000104	RES	CARBON	100 K	5%	1/4 W1		OHMITE	RC07GF104J
R07	000104	RES	CARBON	100 K	5%	1/4 W1		OHMITE	RC07GF104J
R08	000204	RES	CARBON	200 K	5%	1/4 W		OHMITE	RC07GF204J
R09	010290	RES	METAL	180 K	1%	1/4 W		ELECTRA	RN60D1803F
R10	020078	RES	WW	50 K	.1%	1/8 W		JORDAN	J-11
R11	010291	RES	METAL	100 K	.25%	1/2 W		PYROFILM	PME65T100K
R12	010291	RES	METAL	100 K	.25%	1/2 W		PYROFILM	PME65T100K
R13	010292	RES	METAL	200 K	.25%	1/2 W		PYROFILM	PME65T200K
R14	020121	RES	WW	180 K	.1%	1/8 W		JORDAN	J-11
R15	021103	RES	WW	50 K	.05%	1/4 W		KELVIN	EP-21
R16	020242	RES	WW	100 K	.05%	1/4 W		JORDAN	J12
R17	020242	RES	WW	100 K	.05%	1/4 W		JORDAN	J12
R18	020243	RES	WW	200 K	.05%	1/4 W		JORDAN	J12
R19	000203	RES	CARBON	20 K	5%	1/4 W1		OHMITE	RC07GF203J

PARTS LIST

ASSEMBLY 400892 - **PC Board Assembly - Null Detector** - Model 5500-112/130

REF. DESIG.	PART NO.	DESCRIPTION						
CR1	211083	DIODE SILICO	018			1	DANA	211083
CR2	210010	DIODE GE	S-322				GE	S368
CR3	210010	DIODE GE	S-322				GE	S368
CR4	211083	DIODE SILICO	018			1	DANA	211083
CR5	211083	DIODE SILICO	018			1	DANA	211083
CR6	211083	DIODE SILICO	018			1	DANA	211083
CR7	211083	DIODE SILICO	018			1	DANA	211083
CR8	211083	DIODE SILICO	018			1	DANA	211083
CR9	211083	DIODE SILICO	018			1	DANA	211083
CR10	220004	DIODE SILICO ZENER	1N961B			1	MOTOROLA	1N961B
CR11	211083	DIODE SILICO	018			1	DANA	211083
C01	110047	CAP ELECT	50 MFD	50 V	20%		DUCATI	50-50
C02	110047	CAP ELECT	50 MFD	50 V	20%		DUCATI	50-50
C03	110043	CAP ELECT	25 MFD	25 V	20%		DUCATI	25-25
C04	101175	CAP CERAM	220 PFD	500 V	10%1		AEROVOX	SCD1X5F
C05	110043	CAP ELECT	25 MFD	25 V	20%		DUCATI	25-25
C06	101642	CAP CERAM	150 PFD	500 V	10%1		AEROVOX	SCD2X5F
C07	110043	CAP ELECT	25 MFD	25 V	20%		DUCATI	25-25
C08	110017	CAP TANTA	1 MFD	35 V	10%1		KEMET	K1C35K
C09	111097	CAP ELECT	50 MFD	50 V	20%1		SPRAGUE	TE1307
C10	111097	CAP ELECT	50 MFD	50 V	20%1		SPRAGUE	TE1307
C11	121092	CAP MYLAR	.0022 MFD	100 V	10%		CDE	WMF1D22
Q01	200043	TRANS SILICO NPN	2N3565				FAIRCHILD	2N3565
Q02	200054	TTRANS SILICO NPN	FSV				DANA	200054
Q03	200067	TRANS	PNP		019		DANA	200067
Q04	200043	TRANS SILICO NPN	2N3565				FAIRCHILD	2N3565
Q05	200054	TTRANS SILICO NPN	FSV				DANA	200054
Q06	200035	TRANS SILICO NPN	014				DANA	200035
Q07	200011	TRANS SILICO PNP	009				DANA	200011
Q08	200036	TRANS SILICO NPN	015				DANA	200036
Q09	200040	TRANS SILICO NPN	016				DANA	200040
Q12	200037	TRANS SILICO NPN	2N3646				FAIRCHILD	2N3646
Q13	200037	TRANS SILICO NPN	2N3646				FAIRCHILD	2N3646
Q14	200022	TRANS SILICO PNP	012				DANA	200022
Q15	200043	TRANS SILICO NPN	2N3565				FAIRCHILD	2N3565
Q16	200043	TRANS SILICO NPN	2N3565				FAIRCHILD	2N3565

PARTS LIST

ASSEMBLY 400892 - **PC Board Assembly - Null Detector** - Model 5500-112/130

REF. DESIG.	PART NO.	DESCRIPTION							
R38	001711	RES	FSV		5%	1/4 W	DANA	001711
R39	020244	RES	WW	MATCH SET			DANA	020244
R40	000102	RES	CARBON	1 K	5%	1/4 W1	OHMITE	RC07GF102J
R41	000512	RES	CARBON	5.1K	5%	1/4 W1	OHMITE	RC07GF512J
R42	000273	RES	CARBON	27 K	5%	1/4 W1	OHMITE	RC07GF273J
R43	000512	RES	CARBON	5.1 K	5%	1/4 W1	OHMITE	RC07GF512J
R44	001711	RES	FSV		5%	1/4 W	DANA	001711
R45	020244	RES	WW	MATCH SET			DANA	020244
R46	000122	RES	CARBON	1.2 K	5%	1/4 W1	OHMITE	RC07GF122J
R47	000183	RES	CARBON	18 K	5%	1/4 W1	OHMITE	RC07GF183J
R48	001711	RES	FSV		5%	1/4 W	DANA	001711
R49	020244	RES	WW	MATCH SET			DANA	020244
R50	001692	RES	CARBON	4.7 K	5%	1/2 W	OHMITE	RC20GF472J
R51	001711	RES	FSV		5%	1/4 W	DANA	001711
R52	020244	RES	WW	MATCH SET			DANA	020244
R53	001283	RES	CARBON	5.1 K	5%	1/2 W1	OHMITE	RC20GF512J
R54	001692	RES	CARBON	4.7 K	5%	1/2 W	OHMITE	RC20GF472J
R55	001711	RES	FSV		5%	1/4 W	DANA	001711
R56	020244	RES	WW	MATCH SET			DANA	020244
R57	000303	RES	CARBON	30 K	5%	1/4 W1	OHMITE	RC07GF303J
R58	000124	RES	CARBON	120 K	5%	1/4 W1	OHMITE	RC07GF124J
R59	000392	RES	CARBON	0003.9 K	5%	1/4 W1	OHMITE	RC07GF392J
R60	000101	RES	CARBON	100 OHM	5%	1/4 W1	OHMITE	RC07GF101J
R61	000101	RES	CARBON	100 OHM	5%	1/4 W1	OHMITE	RC07GF101J
R62	000201	RES	CARBON	200 OHM	5%	1/4 W1	OHMITE	RC07GF201J
R63	001711	RES	FSV		5%	1/4 W	DANA	001711
R64	000473	RES	CARBON	47 K	5%	1/4 W1	OHMITE	RC07GF473J
R65	000133	RES	CARBON	13 K	5%	1/4 W1	OHMITE	RC07GF133J
R-R65	000682	RES	CARBON	6.8 K	5%	1/4 W1	OHMITE	RC07GF682J
R66	001711	RES	FSV		5%	1/4 W	DANA	001711
R67	040061	RES	VARI	100 OHM	20%	1/2 W	BOURNS	3067-P-1-101
R68	001711	RES	FSV		5%	1/4 W	DANA	001711
R69	001711	RES	FSV		5%	1/4 W	DANA	001711

PARTS LIST

ASSEMBLY 400894 **SEQUENCE LOGIC** - Model 5500-112/130

REF. DESIG.	PART NO.	DESCRIPTION							
C01	100012	CAP	CERAM	33	PFD	500 V	10%	AEROVOX	TCD-N750
V-C01	100010	CAP	CERAM	68	PFD	500 V	10%	AERVOX	TCD-N750
C03	101182	CAP	CERAM	47	PFD	500 V	10%1	AEROVOX	TCD-N750
C04	120011	CAP	POLYS	.068	MFD	100 V	10%	CDE	WMF1568
C05	120011	CAP	POLYS	.068	MFD	100 V	10%	CDE	WMF1568
C06	120011	CAP	POLYS	.068	MFD	100 V	10%	CDE	WMF1568
Q01	200037	TRANS	SILICO NPN		2N3646			FAIRCHILD	2N3646
Q02	200037	TRANS	SILICO NPN		2N3646			FAIRCHILD	2N3646
Q07	200037	TRANS	SILICO NPN		2N3646			FAIRCHILD	2N3646
Q08	200037	TRANS	SILICO NPN		2N3646			FAIRCHILD	2N3646
Q09	200037	TRANS	SILICO NPN		2N3646			FAIRCHILD	2N3646
Q10	200037	TRANS	SILICO NPN		2N3646			FAIRCHILD	2N3646
R01	000222	RES	CARBON	2.2	K	5%	1/4 W1	OHMITE	RC07GF222J
R02	000153	RES	CARBON	15	K	5%	1/4 W1	OHMITE	RC07GF153J
R03	000222	RES	CARBON	2.2	K	5%	1/4 W1	OHMITE	RC07GF222J
R04	000153	RES	CARBON	15	K	5%	1/4 W1	OHMITE	RC07GF153J
R08	000123	RES	CARBON	12	K	5%	1/4 W1	OHMITE	RC07GF123J
L-R08	000512	RES	CARBON	5.1	K	5%	1/4 W1	OHMITE	RC07GF512J
B-R08	000512	RES	CARBON	5.1	K	5%	1/4 W1	OHMITE	RC07GF512J
R10	000273	RES	CARBON	27	K	5%	1/4 W1	OHMITE	RC07GF273J
R14	000153	RES	CARBON	15	K	5%	1/4 W1	OHMITE	RC07GF153J
R15	000273	RES	CARBON	27	K	5%	1/4 W1	OHMITE	RC07GF273J
R16	000822	RES	CARBON	8.2	K	5%	1/4 W1	OHMITE	RC07GF822J
R17	000153	RES	CARBON	15	K	5%	1/4 W1	OHMITE	RC07GF153J
R18	000104	RES	CARBON	100	K	5%	1/4 W1	OHMITE	RC07GF104J
R19	000822	RES	CARBON	8.2	K	5%	1/4 W1	OHMITE	RC07GF822J
R20	000153	RES	CARBON	15	K	5%	1/4 W1	OHMITE	RC07GF153J
R21	000153	RES	CARBON	15	K	5%	1/4 W1	OHMITE	RC07GF153J
R22	000153	RES	CARBON	15	K	5%	1/4 W1	OHMITE	RC07GF153J
R23	000273	RES	CARBON	27	K	5%	1/4 W1	OHMITE	RC07GF273J
R24	000333	RES	CARBON	33	K	5%	1/4 W	OHMITE	RC07GF333J
R25	000822	RES	CARBON	8.2	K	5%	1/4 W1	OHMITE	RC07GF822J

PARTS LIST

ASSEMBLY 402501 CONTROL LOGIC - Model 5500-112/130

REF. DESIG.	PART NO.	DESCRIPTION							
C1	100012	CAP	CERAM	33	PFD	500 V	10%	AEROVOX	TCD-N750
A-C1	101182	CAP	CERAM	47	PFD	500 V	10%1	AEROVOX	TCD-N750
B-C1	101182	CAP	CERAM	47	PFD	500 V	10%1	AEROVOX	TCD-N750
K-C1	101145	CAP	MYLAR	100	PFD	500 V	10%1	CDE	SCD1XSF
C3	121093	CAP	MYLAR	.047	MFD	100 V	10%1	CDE	WMF1S47
C4	121473	CAP	MYLAR	.0015	MFD	100 V	10%1	CDE	WMF1S47
C5	121473	CAP	MYLAR	.0015	MFD	100 V	10%1	CDE	WMF1S47
C6	121090	CAP	MYLAR	.015	MFD	100 V	10%1	CDE	WMF1S15
C7	110017	CAP	TANTA	1	MFD	35 V	10%1	KEMET	K1C35K
C8	110001	CAP	TANTA	6.8	MFD	35 V	10%1	KEMET	K6R8C35K
C9	110001	CAP	TANTA	6.8	MFD	35 V	10%1	KEMET	K6R8C35K
C10	110043	CAP	ELECT	25	MFD	25 V	20%	DUCATI	25-25
Q1	200037	TRANS	SILICO NPN		2N3646			FAIRCHILD	2N3646
Q2	200037	TRANS	SILICO NPN		2N3646			FAIRCHILD	2N3646
Q7	200037	TRANS	SILICO NPN		2N3646			FAIRCHILD	2N3646
Q8	200037	TRANS	SILICO NPN		2N3646			FAIRCHILD	2N3646
Q09	200037	TRANS	SILICO NPN		2N3646			FAIRCHILD	2N3646
Q10	200037	TRANS	SILICO NPN		2N3646			FAIRCHILD	2N3646
Q11	200011	TRANS	SILICO PNP		009			DANA	200011
Q12	200037	TRANS	SILICO NPN		2N3646			FAIRCHILD	2N3646
Q13	200037	TRANS	SILICO NPN		2N3646			FAIRCHILD	2N3646
Q14	200037	TRANS	SILICO NPN		2N3646			FAIRCHILD	2N3646
Q15	200037	TRANS	SILICO NPN		2N3646			FAIRCHILD	2N3646
Q16	200037	TRANS	SILICO NPN		2N3646			FAIRCHILD	2N3646
Q17	200159	TRANS						DANA	200159
Q18	200159	TRANS						DANA	200159
R1	000222	RES	CARBON	2.2	K		5% 1/4 W1	OHMITE	RC07GF222J
R2	000153	RES	CARBON	15	K		5% 1/4 W1	OHMITE	RC07GF153J
R3	000222	RES	CARBON	2.2	K		5% 1/4 W1	OHMITE	RC07GF222J
R4	000153	RES	CARBON	15	K		5% 1/4 W1	OHMITE	RC07GF153J
R8	000123	RES	CARBON	12	K		5% 1/4 W1	OHMITE	RC07GF123J
H-R8	000432	RES	CARBON	4.3	K		5% 1/4 W1	OHMITE	RC07GF432J
R9	000204	RES	CARBON	200	K		5% 1/4 W	OHMITE	RC07GF204J
R10	000273	RES	CARBON	27	K		5% 1/4 W1	OHMITE	RC07GF273J
R16	000122	RES	CARBON	1.2	K		5% 1/4 W1	OHMITE	RC07GF122J
R17	000153	RES	CARBON	15	K		5% 1/4 W1	OHMITE	RC07GF153J
R18	000822	RES	CARBON	8.2	K		5% 1/4 W1	OHMITE	RC07GF822J
R19	000822	RES	CARBON	8.2	K		5% 1/4 W1	OHMITE	RC07GF822J
R20	000122	RES	CARBON	1.2	K		5% 1/4 W1	OHMITE	RC07GF122J
R21	000153	RES	CARBON	15	K		5% 1/4 W1	OHMITE	RC07GF153J
R22	000201	RES	CARBON	200	OHM		5% 1/4 W1	OHMITE	RC07GF201J
R24	000153	RES	CARBON	15	K		5% 1/4 W1	OHMITE	RC07GF153J

PARTS LIST

ASSEMBLY 402501 CONTROL LOGIC - Model 5500-112/130

REF. DESIG.	PART NO.	DESCRIPTION						
R25	000104	RES	CARBON	100 K	5%	1/4 W1	OHMITE	RC07GF104J
R26	000822	RES	CARBON	8.2 K	5%	1/4 W1	OHMITE	RC07GF822J
R27	000622	RES	CARBON	6.2 K	5%	1/4 W1	OHMITE	RC07GF622J
R28	000153	RES	CARBON	15 K	5%	1/4 W1	OHMITE	RC07GF153J
R29	000242	RES	CARBON	2.4 K	5%	1/4 W1	OHMITE	RC07GF242J
R30	000153	RES	CARBON	15 K	5%	1/4 W1	OHMITE	RC07GF153J
R31	000104	RES	CARBON	100 K	5%	1/4 W1	OHMITE	RC07GF104J
R32	000122	RES	CARBON	1.2 K	5%	1/4 W1	OHMITE	RC07GF122J
R33	000221	RES	CARBON	220 OHM	5%	1/4 W1	OHMITE	RC07GF221J
R34	000203	RES	CARBON	20 K	5%	1/4 W1	OHMITE	RC07GF203J
R35	000203	RES	CARBON	20 K	5%	1/4 W1	OHMITE	RC07GF203J
R36	000122	RES	CARBON	1.2 K	5%	1/4 W1	OHMITE	RC07GF122J
R37	000104	RES	CARBON	100 K	5%	1/4 W1	OHMITE	RC07GF104J
R38	000752	RES	CARBON	7.5 K	5%	1/4 W1	OHMITE	RC07GF752J
R39	000104	RES	CARBON	100 K	5%	1/4 W1	OHMITE	RC07GF104J
R40	000222	RES	CARBON	2.2 K	5%	1/4 W1	OHMITE	RC07GF222J
R41	000133	RES	CARBON	13 K	5%	1/4 W1	OHMITE	RC07GF133J
R42	040003	RES	VARI	20 K	10%	1/2 W	BOURNS	3067-P-1-20
R43	000222	RES	CARBON	2.2 K	5%	1/4 W1	OHMITE	RC07GF222J
R44	000104	RES	CARBON	100 K	5%	1/4 W1	OHMITE	RC07GF104J
R45	000243	RES	CARBON	24 K	5%	1/4 W1	OHMITE	RC07GF243J
R46	000822	RES	CARBON	8.2 K	5%	1/4 W1	OHMITE	RC07GF822J
R47	000103	RES	CARBON	10 K	5%	1/4 W1	OHMITE	RC07GF103J
R48	000103	RES	CARBON	10 K	5%	1/4 W1	OHMITE	RC07GF103J
R49	000103	RES	CARBON	10 K	5%	1/4 W1	OHMITE	RC07GF103J
R50	000103	RES	CARBON	10 K	5%	1/4 W1	OHMITE	RC07GF103J
R51	000273	RES	CARBON	27 K	5%	1/4 W1	OHMITE	RC07GF273J

PARTS LIST

ASSEMBLY 400895 **REFERENCE AND BUFFER** - Model 5500-112/130

REF. DESIG.	PART NO.	DESCRIPTION							
CR1	220007	DIODE SILICO ZENER 1N751					1	MOTOROLA	1N751
CR2	211236	DIODE SILICO			007			DANA	211236
CR4	211083	DIODE SILICO			018		1	DANA	211083
CR5	211083	DIODE SILICO			018		1	DANA	211083
CR6	211083	DIODE SILICO			018		1	DANA	211083
CR3	402376	ASSEMBLY REF ELEMENT						DANA	402376
CR7	211083	DIODE SILICO			018		1	DANA	211083
CR8	211083	DIODE SILICO			018		1	DANA	211083
CR9	211083	DIODE SILICO			018		1	DANA	211083
CR10	220012	DIODE SILICO ZENER 1N958B					1	MOTOROLA	1N958B
CR11	220004	DIODE SILICO ZENER 1N961B					1	MOTOROLA	1N961B
CR12	211083	DIODE SILICO			018		1	DANA	211083
CR13	211083	DIODE SILICO			018		1	DANA	211083
CR14	211083	DIODE SILICO			018		1	DANA	211083
CR15	211083	DIODE SILICO			018		1	DANA	211083
CR16	211083	DIODE SILICO			018		1	DANA	211083
CR17	210004	DIODE SILICO			SD4			DIODES IN SD4	
C01	101145	CAP	CERAM	100	PFD	500 V	10%1	AEROVOX	SCD1X5F
C02	101145	CAP	CERAM	100	PFD	500 V	10%1	AEROVOX	SCD1X5F
C03	101642	CAP	CERAM	150	PFD	500 V	10%1	AEROVOX	SCD2X5F
C05	110017	CAP	TANTA	1	MFD	35 V	10%1	KEMET	K1C35K
C06	110001	CAP	TANTA	6.8	MFD	35 V	10%1	KEMET	K6R8C35K
C07	101641	CAP	CERAM	470	PFD	500 V	10%1	AEROVOX	SCD1X5F
C08	101641	CAP	CERAM	470	PFD	500 V	10%1	AEROVOX	SCD1X5F
C09	110036	CAP	ELECT	25	MFD	50 V	20%	DUCATI	25-50
C10	110036	CAP	ELECT	25	MFD	50 V	20%	DUCATI	25-50
C11	110038	CAP	ELECT	50	MFD	15 V	20%	DUCATI	50-15
C12	110038	CAP	ELECT	50	MFD	15 V	20%	DUCATI	50-15
C13	110007	CAP	TANTA	6	MFD	25 V	20%1	GE	29F56664
C14	120001	CAP	MYLAR	.0033	MFD	100 V	10%1	CDE	WMF1D33
C15	110007	CAP	TANTA	6	MFD	25 V	20%1	GE	29F56664
C16	121093	CAP	MYLAR	.047	MFD	100 V	10%1	CDE	WMF1S47
C17	121088	CAP	MYLAR	.01	MFD	100 V	10%	CDE	WMF1S1
C18	101145	CAP	CERAM	100	PFD	500 V	10%1	AEROVOX	SCD1X5F
C19	101642	CAP	CERAM	150	PFD	500 V	10%1	AEROVOX	SCD2X5F
K01	310021	RELAY DC		2	PDT	24V	1	ALLIED	AZ42056105
Q01	200036	TRANS SILICO NPN			015			DANA	200036
Q02	200043	TRANS SILICO NPN			2N3565			FAIRCHILD	2N3565
Q03	200035	TRANS SILICO NPN			014			DANA	200035

PARTS LIST

ASSEMBLY 400895 **REFERENCE AND BUFFER** - Model 5500-112/130

REF. DESIG.	PART NO.	DESCRIPTION								
Q04	200044	TRANS SILICO NPN DUAL FSV							DANA	200044
Q05	200044	TRANS SILICO NPN DUAL FSV							DANA	200044
Q06	200043	TRANS SILICO NPN			2N3565				FAIRCHILD	2N3565
Q07	200011	TRANS SILICO PNP			009				DANA	200011
Q08	200043	TRANS SILICO NPN			2N3565				FAIRCHILD	2N3565
Q09	200040	TRANS SILICO NPN			016				DANA	200040
Q10	200040	TRANS SILICO NPN			016				DANA	200040
Q11	200043	TRANS SILICO NPN			2N3565				FAIRCHILD	2N3565
Q12	200022	TRANS SILICO PNP			012				DANA	200022
Q13	200043	TRANS SILICO NPN			2N3565				FAIRCHILD	2N3565
Q14	200011	TRANS SILICO PNP			009				DANA	200011
Q15	200011	TRANS SILICO PNP			009				DANA	200011
Q16	200011	TRANS SILICO PNP			009				DANA	200011
Q17	200022	TRANS SILICO PNP			012				DANA	200022
R01	000512	RES	CARBON	5.1	K	5%	1/4	W1	OHMITE	RC07GF512J
R05	001750	RES	CARBON	5.60	OHM	5%	1/4	W	DANA	001750
R06	000126	RES	CARBON	12	M	5%	1/4	W	OHMITE	RC07GF126J
R04	402376	ASSEMBLY REF ELEMENT							DANA	402376
R07	020123	RES	WW	10	K	.01%	1/8	W	JORDAN	J11
R08	040050	RES	VARI	5	K	10%	1/2	W	BOURNS	3067-P-1-K0
R09	020123	RES	WW	10	K	.01%	1/8	W	JORDAN	J11
R10	040003	RES	VARI	20	K	10%	1/2	W	BOURNS	3067-P-1-20
R12	000681	RES	CARBON	680	OHM	5%	1/4	W1	OHMITE	RC07GF681J
R11	402376	ASSEMBLY REF ELEMENT							DANA	402376
R13	000107	RES	CARBON	100	M	5%	1/4	W	OHMITE	RC07GF107J
R14	000107	RES	CARBON	100	M	5%	1/4	W	OHMITE	RC07GF107J
R15	001674	RES	CARBON	680	OHM	5%	1/2	W1	OHMITE	RC20GF681J
R16	010145	RES	METAL	324	K	1%	1/4	W1	ELECTRA	RN60C3243F
R17	040054	RES	VARI	50	K	10%	1/5	W	BOURNS	3068-P-1503
R18	010091	RES	METAL	11	K	1%	1/4	W1	ELECTRA	RN60D1102F
R19	010145	RES	METAL	324	K	1%	1/4	W1	ELECTRA	RN60C3243F
R20	000680	RES	CARBON	68	OHM	5%	1/4	W	OHMITE	RC07GF680J
R21	000242	RES	CARBON	2.4	K	5%	1/4	W1	OHMITE	RC07GF242J
R22	000242	RES	CARBON	2.4	K	5%	1/4	W1	OHMITE	RC07GF242J
R23	000565	RES	CARBON	5.6	M	5%	1/4	W1	OHMITE	RC07GF565J
R24	000335	RES	CARBON	3.3	M	5%	1/4	W1	OHMITE	RC07GF335J
R25	000822	RES	CARBON	8.2	K	5%	1/4	W1	OHMITE	RC07GF822J
R26	000101	RES	CARBON	100	OHM	5%	1/4	W1	OHMITE	RC07GF101J
R27	010114	RES	METAL	4.02	K	1%	1/4	W	ELECTRA	RN60D4021F
R28	010114	RES	METAL	4.02	K	1%	1/4	W	ELECTRA	RN60D4021F

PARTS LIST

ASSEMBLY 400895 **REFERENCE AND BUFFER** - Model 5500-112/130

REF. DESIG.	PART NO.	DESCRIPTION							
R29	010299	RES	METAL	12 K	1%	1/4 W	ELECTRA	RN60D1202F	
R30	010300	RES	METAL	750 OHM	1%	1/4 W	ELECTRA	RN60D7500F	
R31	000101	RES	CARBON	100 OHM	5%	1/4 W1	OHMITE	RC07GF101J	
R32	000161	RES	CARBON	160 OHM	5%	1/4 W	OHMITE	RC07GF161J	
R33	000101	RES	CARBON	100 OHM	5%	1/4 W1	OHMITE	RC07GF101J	
R34	000752	RES	CARBON	7.5 K	5%	1/4 W1	OHMITE	RC07GF752J	
R35	000201	RES	CARBON	200 OHM	5%	1/4 W1	OHMITE	RC07GF201J	
R36	000101	RES	CARBON	100 OHM	5%	1/4 W1	OHMITE	RC07GF101J	
R37	000151	RES	CARBON	150 OHM	5%	1/4 W1	OHMITE	RC07GF151J	
R38	000101	RES	CARBON	100 OHM	5%	1/4 W1	OHMITE	RC07GF101J	
R39	000221	RES	CARBON	220 OHM	5%	1/4 W1	OHMITE	RC07GF221J	
R40	000102	RES	CARBON	1 K	5%	1/4 W1	OHMITE	RC07GF102J	
R41	000133	RES	CARBON	13 K	5%	1/4 W1	OHMITE	RC07GF133J	
R42	000150	RES	CARBON	15 OHM	5%	1/4 W1	OHMITE	RC07GF150J	
R43	000220	RES	CARBON	22 OHM	5%	1/4 W1	OHMITE	RC07GF220J	
R44	000150	RES	CARBON	15 OHM	5%	1/4 W1	OHMITE	RC07GF150J	
R45	001260	RES	CARBON	3.9 K	5%	1/2 W	OHMITE	RC20GF392J	
R46	000150	RES	CARBON	15 OHM	5%	1/4 W1	OHMITE	RC07GF150J	
R47	000122	RES	CARBON	1.2 K	5%	1/4 W1	OHMITE	RC07GF122J	
R48	020359	RES	WW	13.8 K	.01%	1/8 W	JORDAN	J11	
R49	000153	RES	CARBON	15 K	5%	1/4 W1	OHMITE	RC07GF153J	

PARTS LIST

ASSEMBLY 402314 **POWER SUPPLY** - Model 5500-112/130 A

REF. DESIG.	PART NO.	DESCRIPTION							
C8	110034	CAP	ELECT	1000	MFD	35	V	DUAL	MALLORY	WP-201.5A
C9	110034	CAP	ELECT	1000	MFD	35	V	DUAL	MALLORY	WP-201.5A
C11	110034	CAP	ELECT	1000	MFD	35	V	DUAL	MALLORY	WP-201.5A
C13	110034	CAP	ELECT	1000	MFD	35	V	DUAL	MALLORY	WP-201.5A
C15	110034	CAP	ELECT	1000	MFD	35	V	DUAL	MALLORY	WP-201.5A
C19	110034	CAP	ELECT	1000	MFD	35	V	DUAL	MALLORY	WP-201.5A
T1	300017	TRANSFORMER POWER							AZTEC	10311

PARTS LIST

ASSEMBLY 402317 **POWER SUPPLY** - Model 5500-112/130

REF. DESIG.	PART NO.	DESCRIPTION							
C1	121088	CAP	MYLAR	.01 MFD	100 V	10%	CDE	WMF1S1	
C2	121088	CAP	MYLAR	.01 MFD	100 V	10%	CDE	WMF1S1	
C3	121088	CAP	MYLAR	.01 MFD	100 V	10%	CDE	WMF1S1	
C4	121088	CAP	MYLAR	.01 MFD	100 V	10%	CDE	WMF1S1	
C5	120072	CAP	MYLAR	.01 MFD	600 V	10%	CDE	WMF6S1	
C6	110049	CAP	ELECT	500 MFD	50 V		DUCATI	500-50	
C22	110041	CAP	ELECT	250 MFD	6 V	20%	DUCATI	250-6	
C23	110036	CAP	ELECT	25 MFD	50 V	20%	DUCATI	25-50	
C24	110036	CAP	ELECT	25 MFD	50 V	20%	DUCATI	25-50	
C25	101174	CAP	CERAM	.001 MFD	500 V	10%1	AEROVOX	SCD3X5F	
C26	101174	CAP	CERAM	.001 MFD	500 V	10%1	AEROVOX	SCD3X5F	
CR1	210004	DIODE	SILICO	SD4			DIODES IN	SD4	
CR2	210004	DIODE	SILICO	SD4			DIODES IN	SD4	
CR3	210014	DIODE	SILICO	023			DANA	210014	
CR4	210014	DIODE	SILICO	023			DANA	210014	
CR5	210004	DIODE	SILICO	SD4			DIODES IN	SD4	
CR6	210004	DIODE	SILICO	SD4			DIODES IN	SD4	
CR7	210004	DIODE	SILICO	SD4			DIODES IN	SD4	
CR8	210004	DIODE	SILICO	SD4			DIODES IN	SD4	
CR9	210004	DIODE	SILICO	SD4			DIODES IN	SD4	
CR10	210004	DIODE	SILICO	SD4			DIODES IN	SD4	
CR11	210004	DIODE	SILICO	SD4			DIODES IN	SD4	
CR12	210004	DIODE	SILICO	SD4			DIODES IN	SD4	
CR13	210014	DIODE	SILICO	023			DANA	210014	
CR14	210014	DIODE	SILICO	023			DANA	210014	
CR15	210004	DIODE	SILICO	SD4			DIODES IN	SD4	
CR16	210004	DIODE	SILICO	SD4			DIODES IN	SD4	
CR17	210004	DIODE	SILICO	SD4			DIODES IN	SD4	
CR18	220015	DIODE	SILICO ZENER	1N967B			MOTOROLA	1N967B	
CR19	220015	DIODE	SILICO ZENER	1N967B			MOTOROLA	1N967B	
Q1	200035	TRANS	SILICO NPN	014			DANA	200035	
Q2	200011	TRANS	SILICO PNP	009			DANA	200011	
R1	031450	RES	CARBON	220 K	5%	2 W	OHMITE	RC42GF224J	
R2	030008	RES	CARBON	200 OHM	5%	3 W	OHMITE	4399	
R3	000202	RES	CARBON	2 K	5%	1/4 W1	OHMITE	RC07GF202J	
R4	000202	RES	CARBON	2 K	5%	1/4 W1	OHMITE	RC07GF202J	
R5	000151	RES	CARBON	150 OHM	5%	1/4 W1	OHMITE	RC07GF151J	
R6	000151	RES	CARBON	150 OHM	5%	1/4 W1	OHMITE	RC07GF151J	

PARTS LIST

ASSEMBLY 402317 **POWER SUPPLY** - Model 5500-112/130 A

REF. DESIG.	PART NO.	DESCRIPTION							
R7	030007	RES	CARBON	150	OHM	5%	3 W	OHMITE	4396
R8	030007	RES	CARBON	150	OHM	5%	3 W	OHMITE	4396

PARTS LIST

ASSEMBLY 402019 - Model 5500-112/130

A

REF. DESIG.	PART NO.	DESCRIPTION							
C7	110035	CAP	ELECT	50	MFD	35 V	20%	MALLORY	FP-137A
C10	110035	CAP	ELECT	50	MFD	35 V	20%	MALLORY	FP-137A
C12	110035	CAP	ELECT	50	MFD	35 V	20%	MALLORY	FP-137A
C14	110035	CAP	ELECT	50	MFD	35 V	20%	MALLORY	FP-137A
C16	110035	CAP	ELECT	50	MFD	35 V	20%	MALLORY	FP-137A
C17	110035	CAP	ELECT	50	MFD	35 V	20%	MALLORY	FP-137A
C20	110035	CAP	ELECT	50	MFD	35 V	20%	MALLORY	FP-137A
C21	110035	CAP	ELECT	50	MFD	35 V	20%	MALLORY	FP-137A

PARTS LIST

ASSEMBLY 402151 – ISOLATED OUTPUT – Model 5500-112/130

REF DES	PART NO.	DESCRIPTION						
R01	000473	RES	CARBON	47 K		5% 1/4W	OHMITE	RC07GF473J
R02	000473	RES	CARBON	47 K		5% 1/4W	OHMITE	RC07GF473J
R03	000473	RES	CARBON	47 K		5% 1/4W	OHMITE	RC07GF473J
R04	000473	RES	CARBON	47 K		5% 1/4W	OHMITE	RC07GF473J
R05	000473	RES	CARBON	47 K		5% 1/4W	OHMITE	RC07GF473J
R06	000473	RES	CARBON	47 K		5% 1/4W	OHMITE	RC07GF473J
R07	000473	RES	CARBON	47 K		5% 1/4W	OHMITE	RC07GF473J
CR01	211083	DIODE	SILICO		018		DANA	211083
CR02	211083	DIODE	SILICO		018		DANA	211083
CR03	211083	DIODE	SILICO		018		DANA	211083
CR04	211083	DIODE	SILICO		018		DANA	211083
CR05	211083	DIODE	SILICO		018		DANA	211083
CR06	211083	DIODE	SILICO		018		DANA	211083
CR07	211083	DIODE	SILICO		018		DANA	211083
K01	310017	RELAY	REED	PST	12 V		DANA	310017
K02	310017	RELAY	REED	PST	12 V		DANA	310017
K03	310017	RELAY	REED	PST	12 V		DANA	310017
K04	310017	RELAY	REED	PST	12 V		DANA	310017
K05	310017	RELAY	REED	PST	12 V		DANA	310017
K06	310017	RELAY	REED	PST	12 V		DANA	310017
K07	310017	RELAY	REED	PST	12 V		DANA	310017

PARTS LIST

ASSEMBLY 402367 – PRINT COMMAND, MODEL 64 & 74 – Model 5500-112/130

REF DES	PART NO.	DESCRIPTION						
CR05	211083	DIODE	SILICO		018		DANA	211083
K05	310017	RELAY	REED	PST	12 V		DANA	310017
R05	000473	RES	CARBON	47 K		5% 1/4W	OHMITE	RC07GF473J

PARTS LIST

ASSEMBLY 402150 – ISOLATED PROGRAMMING – Model 5500-112/130

CR01	211083	DIODE	SILICO		018	DANA	211083
CR02	211083	DIODE	SILICO		018	DANA	211083
CR03	211083	DIODE	SILICO		018	DANA	211083
CR04	211083	DIODE	SILICO		018	DANA	211083
CR05	211083	DIODE	SILICO		018	DANA	211083
CR06	211083	DIODE	SILICO		018	DANA	211083
CR07	211083	DIODE	SILICO		018	DANA	211083
K01	310017	RELAY	REED	PST	12 V	DANA	310017
K02	310017	RELAY	REED	PST	12 V	DANA	310017
K03	310017	RELAY	REED	PST	12 V	DANA	310017
K04	310017	RELAY	REED	PST	12 V	DANA	310017
K05	310017	RELAY	REED	PST	12 V	DANA	310017
K06	310017	RELAY	REED	PST	12 V	DANA	310017
K07	310017	RELAY	REED	PST	12 V	DANA	310017

PARTS LIST

ASSEMBLY 402165 – COMMAND & HOLD – Model 5500-112/130

REF DES	PART NO.	DESCRIPTION					
CR05	211083	DIODE	SILICO		018	DANA	211083
CR07	211083	DIODE	SILICO		018	DANA	211083
K05	310017	RELAY	REED	PST	12 V	DANA	310017
K07	310017	RELAY	REED	PST	12 V	DANA	310017

PARTS LIST

ASSEMBLY 402149 – RANGE & FUNCTION CODING, D1 – Model 5500-112/130

REF DES	PART NO.	DESCRIPTION						
Q01	200035	TRANS	SILICO	NPN		014	DANA	200035
R01	000103	RES	CARBON	10 K		5% 1/4W	OHMITE	RC07GF103J

PARTS LIST

ASSEMBLY 402655 – RANGE & FUNCTION CODING, D1 – Model 5500-112/130

REF DES	PART NO.	DESCRIPTION						
Q01	200035	TRANS	SILICO	NPN		014	DANA	200035
R01	000103	RES	CARBON	10 K		5% 1/4W	OHMITE	RC07GF103J

PARTS LIST

ASSEMBLY 402594 – FUNCTION DELAY – Model 5500-112/130

REF DES	PART NO.	DESCRIPTION						
C01	110017	CAP	TANTA	1 MFD	35 V	10%	KEMET	K1C35K
C02	110017	CAP	TANTA	1 MFD	35 V	10%	KEMET	K1C35K
C03	110023	CAP	TANTA	2.2 MFD	35 V	10%	KEMET	K22C35K
C04	110102	CAP	TANTA	1.2 MFD	35 V		KEMET	K1R2C35K
C05	110028	CAP		1.5 MFD	35 V	5%	KEMET	K1R5C354
C06	120003	CAP	MYLAR	.1 MFD	100 V	10%	CDE	WMF1P1
CR01	210004	DIODE	SILICO		SD4		DIODES, INC.	SD4
CR02	211236	DIODE	SILICO		007		DANA	211236
CR03	210004	CAP	MYLAR	.1 MFD	100 V	10%	CDE	WMF1P1
CR04	210004	CAP	MYLAR	.1 MFD	100 V	10%	CDE	WMF1P1
CR05	210004	CAP	MYLAR	.1 MFD	100 V	10%	CDE	WMF1P1
CR06	210004	CAP	MYLAR	.1 MFD	100 V	10%	CDE	WMF1P1
Q01	200037	TRANS	SILICO	NPN	2N3646		FAIRCHILD	2N3646
Q02	200037	TRANS	SILICO	NPN	2N3646		FAIRCHILD	2N3646
Q03	200037	TRANS	SILICO	NPN	2N3646		FAIRCHILD	2N3646
Q07	200037	TRANS	SILICO	NPN	2N3646		FAIRCHILD	2N3646
Q08	200043	TRANS	SILICO	NPN	2N3565		FAIRCHILD	2N3565
R01	000123	RES	CARBON	12 K		5% 1/4W	OHMITE	RC07GF123J
R02	000562	RES	CARBON	5.6 K		5% 1/4W	OHMITE	RC07GF562J
R05	000123	RES	CARBON	12 K		5% 1/4W	OHMITE	RC07GF123J
R06	000243	RES	CARBON	24 K		5% 1/4W	OHMITE	RC07GF243J
R07	000154	RES	CARBON	150 K		5% 1/4W	OHMITE	RC07GF154J
R16	000822	RES	CARBON	8.2 K		5% 1/4W	OHMITE	RC07GF822J
R17	000243	RES	CARBON	24 K		5% 1/4W	OHMITE	RC07GF243J
R18	000104	RES	CARBON	100 K		5% 1/4W	OHMITE	RC07GF104J
R19	000123	RES	CARBON	12 K		5% 1/4W	OHMITE	RC07GF123J

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